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**Supplemental Environmental Impact Statement**

OCS EIS/EA  
MMS 90-0005

# **5-Year Outer Continental Shelf Oil and Gas Leasing Program**

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**Mid-1987 to Mid-1992**

**Final**

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**5-Year  
Outer Continental Shelf  
Oil and Gas Leasing Program**

**Mid-1987 to Mid-1992**

**Final**

## **COVER SHEET**

### **Supplemental Environmental Impact Statement 5-Year Outer Continental Shelf Oil and Gas Leasing Program Mid 1987 To Mid 1992**

Draft Supplement( )

Final Supplement(x)

Type of Action:

Administrative(x)

Legislative( )

Area of Potential Impact:

Offshore Marine Environment and Coastal Counties of Alaska, California, Oregon,  
and Washington.

Responsible Agency:

U.S. Department of the Interior  
Minerals Management Service  
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Herndon, VA 22070

Abstract:

This final document supplements the final environmental impact statement prepared for the 5-Year (Mid-1987 to Mid-1992) Outer Continental Shelf (OCS) oil and gas leasing schedule. This document analyzes the cumulative impacts of OCS development on migratory species whose migration routes traverse more than one planning area in the Alaska and Pacific Regions. The analysis is based on the court's premise that the Secretary did not consider the effects of simultaneous inter-regional development on migratory species. It also describes and incorporates into the analysis the OCS oil and gas activities and non-OCS activities along those migration routes.

The overall cumulative impacts on migratory species could be caused by oil and gas activities, oil spills, effluent discharges, noise (aircraft and vessel traffic and human disturbances), loss of habitat, subsistence and sport hunting, and natural perturbations.

Coastal States which are considered in the analysis are: Alaska, Washington, Oregon, and California.

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# SUMMARY



## **SUMMARY**

### **A. Introduction**

On December 30, 1988, the U.S. Court of Appeals for the District of Columbia ruled that the final Environmental Impact Statement (EIS) for the Proposed 5-Year Outer Continental Shelf Oil and Gas Leasing Program, mid-1987 to mid-1992, failed to adequately analyze the cumulative impacts of the proposed leasing program on migratory species. The purpose of this document is to supplement the original cumulative analysis in the final EIS so that the Secretary may determine whether changes to the current 5-year program are warranted.

In order to fully respond to the court's remand, the original assumptions concerning the schedule of sales in the final EISs cumulative case scenario were maintained. The analysis in this document relied on the original schedule of sales, resource estimates and oil spill rates employed for the 1987 Program. Since that time, both the resource estimates and oil spill rates have been revised. The combination of these revisions results in an overall decrease in the estimated number of spills, a major impact producing agent. Since its approval on July 2, 1987, some modifications to the program's schedule have been made as a result of rescheduling of sales for a later date, sales "on hold," and sales being deferred which has resulted in a slower pace of leasing. It therefore, overstates the number of sales, as compared with the current status of the 1987 Program.

Alternative I in the SEIS does not take into consideration the changes in the program since its adoption. This includes the changes as a result of the President's OCS Leasing and Development Task Force decision. The effect of the new information is discussed in the SEIS; however, the analysis continues to rely on resource estimates and oil spill rates employed in the original program as a result of the court's directive.

The specific sale schedule stated under Alternative I is not under active consideration, however, it serves as the basis for the comparative analysis of the three additional alternatives.

### **B. Alternative I - 1987 Program**

Alternative I consists of a total of 38 sales that were scheduled in 21 of the 26 planning areas. Table II.B.1-3 indicates the cumulative impact levels of the 1987 program on migratory species in the Alaska and Pacific OCS Regions. The cumulative impact level takes into account the effects expected from non-OCS activities, existing oil and gas activities, as well as those from the 1987 program and future 5-year programs. Since the 1987 Program was approved on July 2, 1987, several events have resulted in modifications to the schedule which have resulted in delays or sales being placed "on hold." Seven sales were held including two sales in the Alaska Region (see Section II.B.1). In addition, a Presidential Task Force was formed to study the leasing in three controversial areas. The efforts of this Presidential Task Force have been concluded and the recommendations were sent to the President in January 1990. On June 26, 1990, the President announced his decision to support a moratorium on oil and gas leasing and development in Sale 116 (part II), the area south of 26° N. latitude in the eastern Gulf of Mexico; Sale 91 area off northern California; Sale 119 area off central California; and the vast majority of Sale 95 off southern California, until after the year 2000. Only 87 tracts within southern California which are in close proximity to existing oil and gas development would be available for lease after January 1, 1996. In addition, the President directed the Secretary to delay leasing and development offshore Washington and Oregon (Sale 132), and in the Georges Bank area of the North Atlantic (Sale 96) until after the year 2000.

Cumulative impacts to migratory species range from very low to high (Table II. B.II-3). The detailed impact analyses are included in Section IV.D. Impact levels for the migratory species analyzed are defined in Appendix A. The current and future 5-year programs are expected to increase the impacts to migratory species in the Pacific and Alaska Regions to some extent

above the impacts from existing activities. However, the incremental effects of the current and future 5-year programs are not expected to raise the overall impact level for any migratory species except the northern fur seal and certain seabirds (see Sections IV.D.1.c and IV.D.2.b).

### **C. Alternative II - Defer Leasing in One or More Planning Areas**

This alternative would defer leasing in the St. George Basin and/or Navarin Basin in the Alaska and Pacific Regions. The purpose for deferral is to avoid the simultaneous oil and gas development activities that were identified in Section IV.D. as causing impacts on one or more migratory species. It is assumed for this analysis that any planning area deferred under this alternative would also be deferred from leasing under future 5-year programs. Adopting this alternative eliminates the possibility that simultaneous development could occur in the Pacific and Alaska Regions as a result of the current and future 5-year programs. With the exception of the northern fur seal and certain seabirds, the impacts of this alternative are expected to be similar to those described under Alternative I; ranging from very low to high.

Under Alternative II, the cumulative impacts on the northern fur seal are expected to be reduced from high to moderate. The deferral of the St. George Basin and Navarin Basin Planning Areas would lower the cumulative frequency of the northern fur seal's potential exposure to large oil spills in the Pribilof Islands - Unimak Pass area (i.e., areas of high concentration of individuals). This alternative represents a significant reduction in the cumulative risk from multiple exposures to oil spills in areas of high northern fur seal concentrations. It is expected that moderate impacts to the species would result from past, ongoing and projected non-OCS and past and ongoing OCS activities.

Under Alternative II, the cumulative impacts on seabirds (particularly the alcid species) would be lower than for Alternative I. St. Matthew Hall, the Pribilof Islands, and Unimak Pass areas support the largest concentration of the alcid species. With the deferral of the St. George Basin and Navarin Basin Planning Areas, it is presumed there would be fewer seabirds exposures to large oil spills and consequently, a decrease in the expected oil-related mortality. It is therefore, expected that only moderate impacts to the species would result from past, ongoing and projected non-OCS and past and ongoing OCS activities.

### **D. Alternative III - Phased OCS Development**

An alternative to "stagger" or "phase" OCS development in the Alaska and Pacific Regions was developed to determine if changes in the timing of impact causing activities as a result of the current and future 5-year programs would measurably reduce the level of impact expected. Lease sales would be held in the Chukchi Sea, Beaufort Sea, and Navarin Basin Planning Areas during the current and possibly future 5-year programs. The remaining planning areas within the regions would be deferred from leasing.

The Secretary's implementation of this alternative requires decisions beyond the scope of this 5-year program. Pursuant to section 18 of the OCSLA, as amended, 43 U.S.C. §1344, the Secretary's decision on the size, timing, and location of leasing activities is restricted to the 5-year period of the 1987 Program. In addition, any suspension or temporary prohibition of any operation or activity (development or production) pursuant to any lease is governed by section 5 of the OCSLA, as amended, 43 U.S.C. §1334.

For the purpose of analysis, it was assumed that no new oil and gas exploration, development and production would occur in the deferred planning areas as a result of the past, current or future 5-year programs with the exception of the Southern California Planning Area. Under this Alternative, there would be no new leases in the Southern California Planning Area as a result of the current and future program. At this time, no assumption is made as to which planning areas may be considered for leasing or deferral beyond the 35- to 40-year period



covered by the cumulative scenario under this alternative. Under Alternative III only three of the planning areas in the Alaska Region would be considered for leasing.

With the assumption of development in the Chukchi Sea, Beaufort Sea and Navarin Basin Planning Areas along the migratory routes of the various species (marine mammals, fish resources, coastal and marine birds), the overall cumulative impacts range from very low to high. Under Alternative III, these migratory species will still experience various levels of cumulative impacts associated with past, ongoing and projected non-OCS activities, and past and ongoing OCS activities (see Section IV.D.) when compared to Alternative I, with the exception of the northern fur seal.

Under Alternative III, the cumulative impact on the northern fur seal is expected to be reduced from high to moderate. The deferral of the eleven planning areas, specifically the St. George Basin Planning Area, would lower the cumulative frequency of the northern fur seal's potential exposure to large oil spills in the Pribilof Islands - Unimak Pass area (i.e., areas of high concentration of individuals). This alternative represents a reduction in the cumulative risk from multiple exposures to oil spills in areas of high northern fur seal concentrations. However, impacts associated with the development and transportation of oil from the Navarin Basin Planning Areas is still expected to effect the northern fur seal.

#### **E. Alternative IV - No Action (Cancel the 1987 Program in the Alaska and Pacific Regions)**

For the purpose of this analysis, this alternative assumes that the remaining lease sales in the current 5-year program within the Alaska and Pacific Regions will be deferred. This alternative would constitute the most extreme level of mitigation to eliminate simultaneous development.

Under this alternative the only Federal oil and gas activities in the Pacific and Alaska Regions would be from previously leased areas. Deferral of the remaining lease sales in the Pacific and Alaska Regions in the current 5-year program would reduce somewhat the impacts to migratory species. However, a comparison of the effects associated with past, ongoing, and projected non-OCS activities and past and ongoing OCS activities, and the current and future 5-year programs indicates that the 5-year program does not increase impacts to migratory species above existing impact levels, with the exception of northern fur seals and certain seabirds. Therefore, this alternative would be expected to reduce the overall impact to the northern fur seal and certain seabirds from a high to a moderate level. The impacts to all other migratory species would remain at the same overall levels as indicated for Alternative I.

The deferral of leasing in Pacific and Alaska Regions would also eliminate all potential impacts of exploration, development, and production activities on all components of the physical, biological, and socioeconomic environment within the planning area from the current 5-year program. Impacts to these resources which would be avoided by this alternative are analyzed in Section IV.B. of the FEIS for the current 5-year program.

# **CHAPTER I**

## **PURPOSE AND NEED FOR THE ACTION**



## **I. Purpose And Need For The Action**

### **A. Five-Year OCS Program Approval and Litigation**

Section 18 of the Outer Continental Shelf Lands Act (OCSLA), as amended, 43 U.S.C. §1344, requires the Secretary of the Interior to prepare, annually review, periodically revise, and maintain a 5-Year Oil and Gas Leasing Program for the U.S. Outer Continental Shelf (OCS). One of the principal purposes of the OCSLA, as amended is to establish policies and procedures which will result in expedited exploration and development of OCS oil and gas resources to achieve national economic and energy policy goals. Consistent with these requirements, the Department of the Interior (DOI) prepared a 5-year program for the period of mid-1987 through mid-1992. The Proposed Final Program contained a schedule of proposed lease sales "indicating as precisely as possible, the size, timing, and location of leasing activity."

Section 18 mandates that the 5-year program identify the size, timing, and location of leasing and provide for the receipt of fair market value for lands leased and rights conveyed. Section 18 also details both the factors to be considered in the formulation of a new leasing program and the public consultation process, which is designed to provide further information for consideration. Prior to the 1987 program, section 18 requirements have been interpreted by the October 6, 1981, and July 5, 1983, decisions of the U.S. Court of Appeals for the District of Columbia Circuit. The July 5, 1983, decision upheld the 1982 leasing program which preceded the current program.

On July 2, 1987, the Secretary approved the Final 5-Year OCS Oil and Gas Leasing Program. Following this approval, petitioners filed suit in the U.S. Court of Appeals for the District of Columbia Circuit. Petitioners included the Natural Resources Defense Council (NRDC); the States of California, Florida, Massachusetts, Oregon, and Washington; and various environmental groups. They challenged the Secretary of the Interior's OCS Program on a variety of grounds, including alleged violations of the National Environmental Policy Act (NEPA), section 18 of the OCSLA, and section III of Public Law 99-591 (which imposed special procedures for considering leasing offshore California). The petitioners' cases were consolidated on January 29, 1988. The American Petroleum Institute among others, intervened as respondents.

The court found for DOI on all but one of the grounds on which the program was challenged. The court held that in the Final Environmental Impact Statement for the Proposed 5-Year Program (FEIS) the Secretary failed to perform an adequate analysis of the leasing program's potential cumulative impacts on migratory species. The court remanded that matter to the Secretary for further attention and for any revision to the 5-year program that the Secretary might deem necessary as a result of this new analysis.

To respond to the court's remand, and to achieve the objectives outlined by the court, the Supplemental EIS (SEIS) analyzes only the cumulative impacts of OCS development on migratory species whose migration routes traverse more than one planning area in the Alaska and Pacific Regions. The analysis is based on the court's premise that the Secretary did not consider the effects of simultaneous inter-regional development on migratory species in the Alaska and Pacific Regions. The SEIS is expanding the analysis, in terms of cumulative impacts on migratory species as result of the 1987 Program, already conducted in the FEIS.

In taking into consideration this issue raised by the court, the cumulative case scenario previously analyzed was reviewed to determine if the assumptions made in the FEIS were still valid. The review took into consideration the program as adopted by the Secretary on July 2, 1987, as well as the program's status. It was determined (see Section II.B.1) that the FEIS cumulative case scenario was still valid; however, it did not address simultaneous inter-regional

development of the oil and gas resources. To address this issue, the resource estimates from the cumulative case scenario in the FEIS were aggregated.

Since the publication of the FEIS, a joint MMS and U.S. Geological Survey assessment of the undiscovered oil and natural gas resources for the Nation was carried out. This National Resource Assessment resulted in updated resource estimates for offshore United States. An evaluation of the updated resource estimates were made (see Section II.B.1) and it was determined that it was inappropriate to use the new resource estimates for the impact analysis in the SEIS. Since the publication of the draft SEIS in August 1989, resource estimates for the Chukchi Sea, Beaufort Sea, Hope Basin and Northern California Planning Areas were updated. Again, it was determined (see Section II.B.1) that it was inappropriate to use the new resource estimates for the impact analysis.

The cumulative impact analysis is also presented in a single, coherent section rather than fragmented by planning area. It also describes and incorporates into the analysis the OCS and non-OCS activities along those migration routes.

## **B. Scoping**

### **1. Introduction**

Information from Federal, State, and local agencies, and the public regarding alternatives and issues which should be evaluated in the EIS for the Proposed 5-Year Program were solicited during the initial scoping period. Respondents focused their comments on the significant environmental issues attendant to OCS oil and gas leasing and development, and on alternative leasing schedules and presale processes which should be evaluated in the EIS. Issues related to scoping are presented in Section I.E. (pages I-21 to I-30) in the FEIS. The concerns initially raised are still relevant to the cumulative analysis and, therefore, were considered during the analysis process in this SEIS.

### **2. Migratory Species**

In compliance with the court's directive, the SEIS considers the effects of simultaneous OCS development on migratory species. To determine the migratory species to be analyzed, groups of species within the coastal and offshore areas of the Alaska and Pacific Regions were examined first. The migratory species within these groups (marine mammals, coastal and marine birds, fishes and sea turtles) were then identified.

Specific criteria were developed to aid in the determination of which particular species should be analyzed. 1) Is it a migratory species? A migratory species may be either a true migrant or a seasonal disperser. True migrants are species in which a significant portion of the population undertakes an annual movement which is predictable in timing and destination. Seasonal dispersers are species in which a large portion of the population moves seasonally and the movement is not predictable in distance and destination. The seasonal movement is based on several environmental and behavioral factors such as water temperature, availability of food, and previous experience (McConnaughey, 1974). 2) Does the species migrate through more than one of the planning areas in the Alaska or Pacific regions? 3) Could the species be significantly affected by OCS development and non-OCS development in the Alaska or Pacific regions? 4) Are the species representative of a class or group that has generally similar: habitats, migration patterns, and sensitivity or reaction to impact producing factors? If a species met all the criteria listed above it was considered for analysis in the SEIS.

As part of the scoping process, it was determined there are hundreds of species, especially birds, that meet the first three criteria. In many instances the analysis of the cumulative impacts on each individual species for several classes or groups would result in the same sensitivity or



reaction to impact producing factors. Therefore, similar species (as discussed above in criteria 4) were analyzed as part of a group. For example, pelagic (open ocean) birds such as shearwaters, petrels, phalaropes, murrelets, auklets, and gulls were analyzed as a group entitled seabirds. As another example, the harbor porpoise was selected as the representative species for the small cetaceans group.

The grouping of similar species eliminates redundancy and still provides for a comprehensive analysis. Other major groups of birds established for analysis include: other geese, diving ducks, waterfowl and shorebirds (See Table II.B.1-3).

In accordance with CEQ regulations (40 CFR 1501.7), the following species were eliminated from further analysis:

**Marine Turtles:** Three endangered and one threatened sea turtles could occur offshore the Pacific Region (the green sea turtle (*Chelonia mydas*), leatherback turtle (*Dermochelys coriacea*), Pacific ridley turtle (*Lepidochelys olivacea*), and loggerhead sea turtle (*Caretta caretta*), respectively). Sea turtles are, at best, infrequent visitors to coastal California, as they typically inhabit tropical and subtropical seas (Smith and Houch 1989; Stebbins, 1966). The only area in the Pacific Region where turtles are sighted with any frequency is the coastal waters off San Diego County.

During 3 years of surveying offshore California the majority of observations were leatherback turtles (29 sightings of 31 turtles) (Dohl et al., 1983). As it is uncommon to observe sea turtles north of the Southern California Planning Area, these animals were excluded from this analysis.

**Aleutian Canada Geese:** The Aleutian Canada goose is an endangered migratory species that nests in the Aleutian Islands of Alaska and winters in California and Oregon. The species nests in terrestrial habitats and is not known to frequent ocean areas. The population is believed to undergo a non-stop transoceanic migration from nesting to wintering areas. Consequently, it does not appear that the species will be affected by the 5-year program, and therefore this species is not analyzed in the SEIS.

**Albacore Tuna:** Juvenile and adult albacore tuna may occur seasonally offshore California, Oregon, and Washington as part of their transoceanic migration from the central and western north Pacific. Spawning of albacore occurs in the oceanic waters of the central and western Pacific between Hawaii and Japan, with the juveniles and adults typically completing one circuit of their migration per year. Albacore typically pass through the Pacific Region in the late spring, summer, and early fall, but the timing, location, and extent of their northward movement from Mexico and southern California is highly variable and largely a function of temperature and other oceanographic conditions. During their migration through the Pacific Region, albacore occur primarily at distances of 80-500 km offshore, and at depths of 30-180 meters. Since the vast majority of juvenile and adult albacore occur far offshore and in relatively deep water, and the potentially most sensitive early life-history stages (i.e., eggs and larvae) occur in the western Pacific, OCS and non-OCS oil and gas activities are not expected to impact the north Pacific albacore population.

**Other Fish Species:** Several species of fish occurring in the Pacific Region exhibit some degree of coastal movement. These species include thresher shark, northern anchovy, bonito, and mackerel (jack and Pacific). In general, the coastal movements of these species are restricted to one or two planning areas within the Pacific Region, and they are not truly migratory as is the case with salmon, steelhead, and whiting. The coastal movements of these species are most likely related to reproductive activity, and seasonal changes in water temperature or other oceanographic conditions. Significant impacts to regional populations or subpopulations of these species as a result of OCS oil and gas activities are not expected since



pelagic species such as these are distributed and spawn over a large geographic area and depth range.

As the result of the review process for the draft SEIS, several species were identified and included in the analysis. These species are the bald eagle, Pacific walrus, and ice seals. Other species were recommended by commenters that were eliminated from further consideration since they did not satisfy the criteria. The reasons for not adding these species to the analysis are summarized.

**Small Cetaceans:** Several species of small cetaceans were recommended for consideration (pilot whales, white-sided dolphins, Dall's porpoise, northern right whale dolphin). The harbor porpoise is the more common of the small cetaceans in coastal waters of the Alaska and Pacific Regions. Due to their occurrence in coastal habitats they would be most likely to interact with OCS oil and gas activities. Potential impacts on the harbor porpoise as a result of oil and gas activities would be similar to those experienced by other small cetaceans.

**West Indian Manatees:** The West Indian Manatee inhabits mainly the coastal and inshore waters of Florida, the coastal waters of the south Atlantic, and eastern Gulf of Mexico Regions. The SEIS is prepared in compliance with the directive of the court on the adequacy of the cumulative analysis in the Alaska and Pacific Regions. The regional scope of the SEIS is, therefore, confined to the Alaska and Pacific Regions.

**Killer Whales:** In some areas killer whales are resident, while in other areas the killer whale's movement may reflect prey availability. The killer whale, therefore, does not satisfy all the criteria for the species to be included in this cumulative analysis.

**King Crab:** King crabs do not take part in large scale group migrations, do not have distinct migration routes, and are random and non-cyclic in their movements. Therefore, the king crab is not considered for analysis in the SEIS.

**Other Fish:** Several species of fish (Pacific herring, Pacific halibut, black cod (sable fish), Pacific mackerel, northern anchovy, green and white sturgeon, sea-run cutthroat and arctic cisco) were recommended for analysis in the SEIS. These species are either represented in the analysis by a candidate species or were eliminated since they did not meet all the criteria.

**Pacific Halibut** was not analyzed in the SEIS since long-distance migrations are not characteristic of the species. Although tagging experiments have indicated that some fish may move long coastwide distances (Hart 1973, and The International Pacific Halibut Commission 1987), most fish apparently do not migrate over such long distances. Although the life-history characteristics of Pacific halibut differ from Pacific whiting, the early life-history stages (i.e. eggs and larvae) of both species are expected to be most sensitive to oil spill impacts. Impacts to these early life stages of Pacific halibut (as well as juvenile and adult stages) from oil spills associated with existing or approved activities, or the current and future 5-year programs are expected to be generally comparable to that concluded for whiting.

**Sablefish** were not analyzed in the SEIS analysis since they are considered a non-migratory species that moves only short distances (MBC 1987). Although not considered in this analysis, impacts to the two sablefish stocks occurring in the Pacific Region (see MBC, 1987) from oil-related activities or impacting agents associated with existing or approved activities, and the current and future 5-year programs are expected to be generally comparable to that discussed for Pacific Whiting in the SEIS.

**Pacific Herring** was not considered in the SEIS since there was little indication that the species undertakes migrations (Hart 1973) required by the criteria listed above.

**Green And White Sturgeon**, which are anadromous, were not specifically considered in the SEIS since the anadromous salmon and steelhead were considered broadly representative species. Although sturgeon are not salmonids, their general life-history characteristics are similar to salmonids.

**Sea-run Cutthroat Trout** was not specifically analyzed in the SEIS because Pacific salmon and steelhead trout were considered generally representative of this species.

**Arctic Cisco** is not included for analysis in this SEIS because it does not meet all the criteria listed above. That is, it is not a migratory species that could be affected by simultaneous development within more than one planning area.

**Southern Sea Otter**: The southern sea otter was not included for analysis in the SEIS because it does not meet all the criteria. Specifically, the southern sea otter does not "migrate," even though its range encompasses more than one planning area.

**Other Seabirds**: Specific seabirds (ashy storm petrel, common murre, and marbled murrelets) were requested for consideration in the SEIS. Shearwaters, phalaropes, petrels, murrelets, auklets, gull and alcids were chosen as representative of seabirds such as the ashy storm petrel, common murre, and marbled murrelets. Potential impacts to these three species would be similar to those experienced by seabirds in general.

**Golden Eagle**: Golden eagles would not be significantly affected by OCS development in the Alaska or Pacific regions. The golden eagle is an inland species. A more appropriate eagle that has been added to the SEIS analysis to analyze is the bald eagle whose habitat is located near coastal areas and which feeds on fish, thereby having a greater potential to come in contact with OCS development.

**Prey Species**: Several commenters requested that specific prey species (herring and anchovy) be analyzed. Only migratory species were considered in the cumulative analysis. However, indirect impacts to the migratory species were considered based on the potential reduction of prey species from OCS oil and gas activities.

### **3. Method of Analysis**

#### **a. Identification of Activities To be Analyzed**

The cumulative environmental impact on a migratory species depends on past, current, and future human activities that either degrade or enhance the environment in which the animal lives. Although past and current activities are easy to identify, it is not known precisely what activities will take place in the future that might affect these species. For the species analyzed in the SEIS, future activities will probably include: 1) exploration and development of leases that will result from the 5-year leasing program (i.e., the "proposal"); 2) exploration and development of leases that already exist; 3) exploration and development that will result from future OCS leasing programs; and 4) activities that are not associated with the federal OCS program (e.g., shipping). The level of future OCS activity is not precisely known, therefore, it must be estimated in order to provide a basis for analysis. Likewise, estimates are made regarding future non-OCS activities when they are unknown. The basis for estimating the amount of OCS activity that might occur in the future, including accidental oil spills, comes from estimates of the amount of oil and gas that may or could exist on the OCS. The basis for estimating future non-OCS activity comes primarily from our knowledge of specific proposals to develop oil and gas in state waters, to develop non-energy mineral resources, or to conduct other activities that could affect the species analyzed. This estimated OCS and non-OCS activity or the "scenario" is evaluated to determine the potential cumulative impact on migratory species.



The scenario of future OCS activity used in the SEIS is an overstatement of likely future events. The reasons for this are twofold. First, the scenario assumes that all the estimated commercially recoverable oil and gas in each OCS planning area will be developed and produced in the next 35 to 40 years. Although we use this assumption to be consistent with the Court's interpretation of what simultaneous development would entail, it is unlikely to occur. The second reason the scenario tends to overestimate future OCS activity is that the resource estimates used to generate the scenario in this SEIS are generally higher than the most current resource estimates. The reasons that the newer estimates were not used for the SEIS are explained in detail in Section II.B.1.d. As a result, the scenario developed for the SEIS includes more drilling, more facilities, and more oil spills than would be expected from the more recent estimates.

#### **b. Determining The Potential Environmental Effects**

The cumulative scenario incorporates those activities that may affect the particular species being analyzed. These may include OCS and non-OCS activities estimated to occur anywhere within the geographic range of the species. In addition to location, the estimated duration or frequency of the activities that could cause impacts is identified.

Prior to evaluating the cumulative impacts of the scenario, the current condition of each species is assessed. The current condition of a species is a reflection of the effects of past and ongoing activity. This assessment is important because the magnitude of impacts caused by future activities can vary depending on the current viability of the species. For example, the effects of some future activity on an animal that is currently experiencing a population decline may be greater than if the population was stable or increasing.

Each potential cause of impact is evaluated to determine its potential effects. This evaluation process depends on the nature of the cause, the state of knowledge about how the animal may react, and any assumptions made about the animal's exposure to the activity. In each case, the potential for changing migratory patterns, for injuring or killing one or more animals, and of reducing the capacity of the species to reproduce is assessed.

Those activities not related to the current and future 5-year programs are analyzed first. This analysis describes the impacts that could occur to each species in the future (35 to 40 years) in absence of continued OCS leasing. The analysis does account for ongoing OCS development activity and future development of leases issued as a result of prior leasing programs.

Second, an evaluation of the incremental effects of current and future 5-year programs is made. That is, the effects of activities in the cumulative scenario related to the "proposal" are presented in relation to other aspects of the scenario. This assessment is needed to give perspective to the program's contribution to the overall cumulative impact. It also provides an important basis for identifying alternatives to simultaneous development that might afford a substantive reduction in the cumulative impact (as requested by the court).

Finally, the effects from all the activities are then reviewed as a group to assess the effects of the entire scenario on the species. In some instances the analyst may indicate the potential for one or more causes which have no apparent individual significance, to combine in a manner that result in a substantive adverse effect.

#### **c. Reaching Conclusions of Expected Effect**

A conclusion about the cumulative impact is reached for each migratory species or species group. The conclusion is expressed at the end of each analysis as one of five "levels," which are defined in Appendix A. The definitions incorporate a range of the various types of impacts (e.g., changes in animal behavior, reduction in the number of animals that might occur in the future with respect to a particular species or groups of species). In addition the definitions



account for the amount of time needed to recover from these impacts. In order to determine which level is appropriate, the impacts described in the analysis are compared with the impact level definitions that pertain to the species analyzed.

The conclusion is not the impact expected from OCS activities alone. Rather, it is the impact that is expected from OCS and non-OCS activities if the hypothetical scenario (detailed in Sections IV.B. and IV.C) became reality. As indicated previously, the OCS-related portion of the scenario evaluated for cumulative impacts on migratory species is extremely conservative for a variety of reasons. As a result, the conclusions presented are also somewhat conservative. Nonetheless, the conclusions presented do fall within the range of possible cumulative impacts on migratory species.

#### **4. Alternatives**

##### **a. Alternatives To The Proposed Action**

The court's guidelines suggested that the Secretary could, based on the findings of the cumulative analysis, consider alternatives to the proposed action. The Secretary could also examine alternatives to simultaneous development that would mitigate any synergistic impacts on migratory species. Pursuant to CEQ regulations (40 CFR 1502.14) an EIS is required to evaluate all "reasonable alternatives." The EIS must present feasible approaches to the programmatic decision which would alter the potential environmental impacts of the proposed action. Based on the information and analysis present in Section III and IV of the SEIS, alternatives to mitigate the potential impacts as a result of simultaneous development at the programmatic stage were developed.

##### **(1) Alternative II - Defer Leasing in One or More Planning Areas**

This alternative would defer leasing in the St. George Basin and/or Navarin Basin Planning Areas in the Alaska Region. The identification of this alternative was as a result of the analysis in Section IV.D. Impacts to the northern fur seal and certain seabirds were expected to increase as a result of oil development and transportation in the St. George Basin and Navarin Basin Planning Areas. It was determined that the deferral of these Basins would mitigate the impacts of simultaneous oil and gas development activities to these species.

##### **(2) Alternative III - Phased OCS Development**

An alternative to "stagger" or "phase" OCS development in the Alaska and Pacific Region was developed to determine if changes in the timing of impact causing activities would measurably reduce the level of impact expected as a result activities associated with the current and possibly future 5-year programs. Lease sales would be held in the Chukchi Sea, Beaufort Sea, and Navarin Basin Planning Areas during the current and possibly future 5-year programs. Several factors were considered in selecting these planning areas for analysis: whether oil and gas activities were currently taking place; the likelihood of finding oil and gas; and the status of the lease sale schedule. The remaining planning areas within the regions would be deferred from leasing.

The Secretary's implementation of this alternative requires decisions beyond the scope of this 5-year program. Pursuant to section 18 of the OCSLA, as amended, 43 U.S.C. §1344, the Secretary's decision on the size, timing, and location of leasing activities is restricted to the 5-year period of the 1987 Program. In addition, any suspension or temporary prohibition of any operation or activity (development or production) pursuant to any lease is governed by section 5 of the OCSLA, as amended, 43 U.S.C. §1334.

For the purpose of analysis, it is assumed that no new oil and gas exploration, development, and production would occur in the deferred planning areas as a result of the past, current or future 5-year programs with the exception of the Southern California Planning Area. Under this

Alternative, there would be no new leases as a result of the current and future program in the Southern California Planning Area.

**(3) Alternative IV - No Action (Cancel the 1987 Program in the Alaska and Pacific Regions)**

The evaluation of a "no action" alternative is required by the regulation implementing NEPA (40CFR1502.14(D)). For the purpose of this analysis only, this alternative assumes that the remaining lease sales within the Alaska and Pacific Regions will be cancelled for the remainder of the period covered by the 5-year program approved by the Secretary on July 2, 1987. Under this alternative the only Federal oil and gas activities in the Pacific and Alaska Regions would be from previously leased areas. The oil and gas resources that would have become available as a result of the current 5-year program would be foregone. Therefore, that amount of energy would have to be made up by either alternative energy sources or conservation.

**b. Alternatives Eliminated From Further Consideration**

Additional alternatives, listed below, were suggested during the comment period on the draft SEIS. These alternatives were considered and evaluated based on whether they mitigated the potential cumulative impacts as a result of simultaneous development and were reasonable and feasible approaches to the programmatic decision.

**(1) Defer Leasing In Specific Tracts Or The Establishment Of Buffer Zones To Protect Environmentally Sensitive Areas.**

Alternatives at this time must deal with the potential modification of the current 5-year leasing schedule. Actions taken at subsequent phases of the program are not subject to analysis in the SEIS because they are not known and will be evaluated for impacts in subsequent environmental documents. Decisions on deferral of specific tracts or the establishment of buffer zones is typically more appropriate at the lease sale stage. However, as part of the 1987 Program, tracts located offshore of the Yukon and Kuskokwim Rivers were deleted. At the lease sale stage, the potential impacts to the resources can be more clearly identified. Specific alternatives to mitigate these effects such as deferral of site-specific tracts, or the establishment of buffer zones, can then be identified.

**(2) Alternative Energy Sources**

In the FEIS under the No Action Alternative (also see Appendix C in the FEIS) for the current 5-year program the potential environmental impacts of alternative energy sources were discussed. Alternative V (No Action) in the SEIS incorporates the analysis of the original No Action Alternative. Similar to the previous no action alternative, Alternative V defers the remaining lease sales in the current 5-year program. The potential oil and gas resources that would become available as a result of the current 5-year program would be foregone. Therefore, that amount of energy would have to be made up by either alternative energy sources or conservation.

**(3) Elimination Or Restriction Of Certain Tanker Routes**

The benefits of the elimination or restriction of tanker routes in certain areas can be accomplished by Alternatives II, III, and/or IV. Accordingly, the analysis of another alternative would not be warranted. Alternative II was developed to mitigate the impacts to the northern fur seal and certain species of seabirds as a result of potential exposures to oil spills from all sources (platforms, pipelines, and tanker activity) associated with OCS development. For example, three of the four estimated oil spills from OCS production in the St. George Planning Area are from platforms and pipeline accidents, therefore, the elimination or restriction of tanker routes would not provide a substantive reduction in the overall cumulative impact.



**(4) Deferral Of Planning Areas Which Overlie Habitat Areas For  
Pacific Salmon And Steelhead Trout**

Pacific salmon and steelhead trout are primarily experiencing impacts from overharvesting by commercial and sport fishermen, and habitat loss. There is also the risk of potential oil spills as a result of existing coastal tanker activity. The addition of the activities associated with the current and future 5-year programs and the incremental increase in risk of an oil spill occurring and contacting at sensitive life-history stages are only small contributors to the overall impact being experienced by these species. The analysis in Sections IV.D.3.a and IV.D.3.c concluded that the addition of the current and future 5-year programs would not elevate the impact level above past, ongoing, and projected non-OCS activities and past, and ongoing OCS activities. This alternative, therefore, would not provide a substantive reduction in the overall cumulative impact.



# **CHAPTER II**

## **ALTERNATIVES**

## **II. ALTERNATIVES**

### **A. Introduction**

Since its approval on July 2, 1987, some modifications to the program's schedule have been made as a result of rescheduling of sales for a later date, sales "on hold," and sales being deferred. However, the purpose of this EIS is to supplement the cumulative impact analysis in the FEIS, and, based on review of potential impacts on migratory species to reassess whether changes to the current 5-year program are warranted. Therefore, this section describes the program as adopted by the Secretary, and provides a summary of the cumulative impacts of the 1987 Program on migratory species.

The court also suggested that the Secretary could examine alternatives to simultaneous development that would mitigate any cumulative impacts on migratory species. Alternatives were designed explicitly to mitigate, if necessary, the potential impacts to migratory species caused by the 5-year program (See Section I.B.3). The analysis in Section IV.D. of this document distinguishes impacts to migratory species from existing OCS and non-OCS activities from the impacts associated with the current and future 5-year programs. Because of this distinction, the analysis presented in Section IV.D. also serves as the analytical basis for assessing the environmental impacts of Alternatives II and III. This section provides a summary of these alternatives.

### **B. Description of the Alternatives**

#### **1. Alternative I - 1987 Program**

The following is a brief description of the 5-year program, as approved. A description of the 1987 Program may be found in the Proposed Final 5-Year Program Document (DOI, Minerals Management Service (MMS), 1987). The key features of the 1987 Program include:

##### **a. Schedule of Sales**

A total of 38 sales are scheduled in 21 of the 26 OCS planning areas. These sales include: 24 standard lease sales including annual sales in the Central and Western Gulf of Mexico and 14 triennial sales in 9 other planning areas. Of the 38 sales, 11 are frontier exploration sales scheduled at a triennial or less frequent pace. Also included are 3 small supplemental sales outside the Central and Western Gulf of Mexico for selected blocks (including those on which bids were rejected or forfeited during the fiscal year prior to the sale) and for development blocks (including blocks susceptible to drainage from operations on existing leases).

##### **b. Subarea Deferrals**

The 1987 Program defers subareas within 13 planning areas and highlights other subareas within 7 planning areas for special consideration during the presale process.

##### **c. Status of the Current Program**

Since the current 5-Year Program was approved on July 2, 1987, several events have resulted in modifications to the schedule. Seven sales were held including two sales in the Alaska Region - Sale 97, Beaufort Sea, and Sale 109, Chukchi Sea.

A Presidential Task Force was formed to study leasing in three controversial areas. The areas being studied by the task force are the Sale 91 area off northern California, the Sale 95 areas off southern California, and the Sale 116 (part II) the area south of 26° N. latitude in the eastern Gulf of Mexico. The efforts of this Presidential Task Force have been concluded and the recommendations sent to the President in January 1990. On June 26, 1990, the President announced his decision to support a moratorium on oil and gas leasing and development in Sale 116 (part II), Sale 91, and the vast majority of Sale 95 off southern California, until after the

year 2000. Only 87 tracts within southern California which are in close proximity to existing oil and gas development would be available for lease after January 1, 1996. In addition, the President directed the Secretary to delay leasing and development offshore Washington and Oregon (Sale 132), central California (Sale 119), and in the Georges Bank area of the North Atlantic (Sale 96) until after the year 2000.

#### d. Resource Estimates

The analysis in the SEIS is based on the court's premise that the Secretary did not consider the effects of simultaneous inter-regional development on migratory species. In taking into consideration this issue raised by the court, the cumulative case scenario previously analyzed was reviewed to determine if the assumptions made in the FEIS were still valid. This review took into consideration the program as adopted by the Secretary on July 2, 1987, as well as the program's status. The cumulative case scenario was also reevaluated to determine whether the impact analysis of the scenario would provide sufficient information for the Secretary to make a decision at the programmatic stage.

The resource estimates for the FEIS cumulative case scenario for the proposed program included the total leased and unleased resources, and the total developed and undeveloped reserves in each planning area. The FEIS cumulative case also assumed that (1) all resources will eventually be developed although no assumption was made regarding the pace of leasing and development in future 5-year leasing programs over the next 35- to 40-years; and (2) the total resource potential (leased and unleased) contributed to the scenario's infrastructure.

In the FEIS cumulative case scenario, no assumption was made as to what percentage of the total amount of oil and gas within each planning area would be leased and developed as a result of lease sales from the current and future 5-year programs. This assumption was made to take into account any possible changes in the lease sale schedule and the "uncertainty" of leasing in the planning areas in the future. Therefore, changes in the scheduling of sales for a later date, those "on hold," or deferred would not modify the resources, infrastructure or assumptions previously made. Resources expected to be leased as the result of a sale placed "on hold" or deferred would be leased and developed as a result of future sales in the area.

Upon inspection, the same exploration and development assumptions (see Section II.B.1.e) are still valid, since it was assumed that all the hydrocarbons associated with these sales would be developed and produced over the next 35- to 40-years. As part of the original assumption, all the resources in each planning area contributed to the cumulative scenario's infrastructure. In each case, the infrastructure estimates represent the possible level of oil and gas activity needed to develop all the resources in the planning areas.

It was therefore determined that the FEIS cumulative case scenario was still valid; however, it did not address simultaneous inter-regional development of the oil and gas resources. The estimated amount of oil and gas for each planning area (See Table II.B.1-1) represents the quantity of oil and gas and the chance of finding that exact amount. This is based on an assumption that economical quantities of oil and gas are present within each planning area. For example, oil and gas has been discovered and is currently being produced in the Southern California Planning Area, therefore the chance of success in finding oil and gas is 1 (or the marginal probability equals 1).

The estimated amount of oil and gas for each planning area is only valid for that particular planning area because each resource estimate is based on geologic information specific to that planning area. Since the chance of success in finding oil and gas is different in each planning area, it is incorrect to total the volume of oil and gas and infrastructure for all the planning areas. If the oil and gas resources were recalculated to have the same chance of success in finding hydrocarbons, several planning areas would not have economical hydrocarbons.



**Table II.B.1-1 Conditional Oil and Gas Resources, Reserves, and Infrastructure  
for the FEIS and SEIS Cumulative Case**

| <u>PLANNING AREA</u> | <u>OIL<br/>(MMBBL)</u> | <u>GAS<br/>(BCF)</u> | <u>MILLION<br/>BOE</u> | <u>MP<sub>HC</sub>*</u> | <u>NUMBER OF</u>                     |                                       | <u>PLATFORMS</u> |
|----------------------|------------------------|----------------------|------------------------|-------------------------|--------------------------------------|---------------------------------------|------------------|
|                      |                        |                      |                        |                         | <u>EXP. &amp;<br/>DEL.<br/>WELLS</u> | <u>DEV. &amp;<br/>PROD.<br/>WELLS</u> |                  |
| Beaufort Sea         | 1280                   | —                    | 1280                   | 0.70                    | 38                                   | 126                                   | 3                |
| Chukchi Sea          | 2680                   | —                    | 2680                   | 0.20                    | 85                                   | 263                                   | 7                |
| Hope                 | 170                    | 1810                 | 492                    | 0.02                    | 13                                   | 49                                    | 1                |
| Norton               | 640                    | 2940                 | 1163                   | 0.15                    | 45                                   | 112                                   | 4                |
| Navarin              | 4800                   | 5840                 | 5839                   | 0.27                    | 179                                  | 569                                   | 14               |
| St. George           | 1690                   | 15760                | 4494                   | 0.22                    | 147                                  | 444                                   | 12               |
| N. Aleutian          | 360                    | 2620                 | 826                    | 0.20                    | 26                                   | 80                                    | 2                |
| Shumagin             | 50                     | 1420                 | 303                    | 0.03                    | 11                                   | 30                                    | 1                |
| Kodiak               | 150                    | 2920                 | 670                    | 0.05                    | 24                                   | 66                                    | 2                |
| Cook Inlet           | 210                    | 350                  | 272                    | 0.03                    | 11                                   | 25                                    | 1                |
| Gulf of Alaska       | 540                    | 8340                 | 2024                   | 0.08                    | 63                                   | 200                                   | 5                |
| Washington/Oregon    | 180                    | 3260                 | 760                    | 0.20                    | 33                                   | 90                                    | 3                |
| N. California        | 420                    | 1860                 | 751                    | 0.60                    | 33                                   | 88                                    | 3                |
| C. California        | 300                    | 560                  | 400                    | 0.65                    | 21                                   | 46                                    | 2                |
| S. California**      | 2613                   | 4087                 | 3340                   | 1.00                    | 524                                  | 2145                                  | 48               |

\* MP<sub>HC</sub> denotes marginal probability of commercial hydrocarbons.

\*\* Includes developed and undeveloped reserves. The infrastructure for the Southern California Planning Area includes existing, proposed and hypothetical platforms and development and production wells.

Resource estimates are less an amount of resources from areas eliminated from the 5-year program because of deferrals.

Estimates of levels of exploration and development expressed in this table are based solely on the conditional resource level of the planning areas and are therefore, themselves conditional estimates.

MMBBL - Millions of Barrels

BCF - Billion Cubic Feet

BOE - Barrels of Oil Equivalent

resources. A cumulative case scenario using these new numbers would not have exploration, development and production in every planning area and would not address the issue of simultaneous development. However, in order to analyze simultaneous development as requested by the court, a conservative approach was used.

It was assumed for the cumulative analysis in the SEIS that the oil and gas resources and infrastructure in Table II.B.1-1 were comparable and could be totaled. That is, oil and gas exploration, development and production would occur in every planning area within the Alaska and Pacific Regions at the indicated level of activity. The exploration, development and production activities would be distributed over the 35- to 40-year life of the proposed action. Although this assumption is consistent with the court's directive to assess the effects of simultaneous development, the chance of finding oil and gas in every planning area concurrently is remote. Therefore, the only difference between the assumptions of the FEIS and SEIS is that the SEIS assumes the activity would occur in every planning area simultaneously at the activity level indicated.

Since the publication of the FEIS, a joint MMS and U.S. Geological Survey assessment of the undiscovered oil and natural gas resources for the Nation was carried out. This National Resource Assessment (NRA) resulted in updated resource estimates for offshore United States. An evaluation of the updated resource estimates was made to assess whether it was appropriate to use the new resource estimates for the impact analysis.

The NRA conditional resource estimates in barrels of oil equivalent (BOE) for the planning areas in the Alaska and Pacific Regions, are presented in Table II.B.1-2. As stated above, the resource estimates are not additive among planning areas. Also the resource estimates are not comparable between planning areas or between assessments, since they are based on different chances of finding oil and gas.

The decrease in the resource estimates in the new national assessment for eight of the Alaska planning areas is generally attributed to geologic information gained from unsuccessful exploratory drilling since the publication of the FEIS. To some extent the decreases are the effect of less favorable economic conditions. For several planning areas the decrease represents a change in the level of infrastructure required to develop the resources. A determination was made that since the SEIS is supplementing the previous analysis in the FEIS, it was important that consistency in the resource estimates be maintained. The Secretary could, therefore, utilize all the resource information (physical, biological, and socioeconomic) in both documents when making his decision. The significant decreases in the amount of oil and gas, based on professional judgment, would result in lowering potential impacts associated with the development of these resources. For example in the Navarin Basin Planning Area, the estimated mean number of oil spills from all sources is 14. However when a similar calculation is done using the new resource estimates, the estimated mean number of oil spills from all sources is 3. Since oil spills are a major impact producing factor in the cumulative analysis, the reduction in the number of potential oil spills would result in the lowering the level of the potential oil spill-related impacts.

The minor increases in some of the estimates are attributed to new mapping using recently obtained geologic information. However, these increases do not appreciably change the hypothetical infrastructure associated with these estimates. The number of platforms required to develop the amount of hydrocarbons associated with each assessment in the Northern California Planning Area is 3. The only difference in the infrastructure for the platforms would be the number of development and production wells required (34 versus 29 per platform). The difference of 5 wells per platform is not of a magnitude great enough to be able to distinguish an incremental change in the overall cumulative impact levels for the migratory species analyzed.

**Table II.B.1-2 Conditional Oil and Gas Resources, Reserves, and Infrastructure  
for the 1987, National Resource Assessment**

| <u>PLANNING AREA</u> | <u>MILLION<br/>BOE</u> | <u>MP<sub>HC</sub>*</u> | <u>NO. OF</u>                         |                                       | <u>PLATFORMS</u> |
|----------------------|------------------------|-------------------------|---------------------------------------|---------------------------------------|------------------|
|                      |                        |                         | <u>EXPL. &amp;<br/>DEL.<br/>WELLS</u> | <u>DEV. &amp;<br/>PROD.<br/>WELLS</u> |                  |
| Beaufort Sea         | 1440                   | 0.14                    | 43                                    | 142                                   | 3                |
| Chukchi Sea          | 2730                   | 0.22                    | 87                                    | 268                                   | 7                |
| Hope                 | 660                    | 0.01                    | 17                                    | 66                                    | 1                |
| Norton               | 580                    | <0.01                   | 22                                    | 56                                    | 2                |
| Navarin              | 1140                   | 0.03                    | 35                                    | 111                                   | 3                |
| St. George           | 390                    | 0.02                    | 13                                    | 39                                    | 1                |
| N. Aleutian          | 610                    | 0.02                    | 19                                    | 59                                    | 1                |
| Shumagin             | 280                    | 0.01                    | 10                                    | 28                                    | 1                |
| Kodiak               | 430                    | 0.03                    | 15                                    | 42                                    | 1                |
| Cook Inlet           | 170                    | <0.01                   | 16                                    | 16                                    | 1                |
| Gulf of Alaska       | 980                    | 0.04                    | 30                                    | 97                                    | 2                |
| Washington/Oregon    | 540                    | 0.25                    | 23                                    | 64                                    | 2                |
| N. California        | 870                    | 0.60                    | 38                                    | 102                                   | 3                |
| C. California        | 371                    | 0.90                    | 19                                    | 43                                    | 2                |
| S. California**      | 3239                   | 1.00                    | 489                                   | 2066                                  | 46               |

\* MP<sub>HC</sub> denotes marginal probability of commercial hydrocarbons.

\*\* Includes developed and undeveloped reserves. The infrastructure for the Southern California Planning Area includes existing, proposed and hypothetical platforms and development and production wells.

Resource estimates are less an amount of resources from areas eliminated from the 5-year program because of deferrals.

Estimates of levels of exploration and development expressed in this table are based solely on the conditional resource level of the planning areas and are therefore, themselves conditional estimates.

BOE-Barrels of Oil Equivalent



In the FEIS and SEIS the mean number of oil spills estimated as a result of the production and transportation of oil in the Northern California Planning Area is 0.69. For the purpose of analysis, it was assumed that one oil spill would occur. When a similar calculation is made using the resource estimates from the NRA for the Northern California Planning Area, the estimated mean number of oil spills is 0.94. Again for the purpose of analysis, this value would be rounded up and 1 oil spill would be assumed to occur. For each planning area where there was an increase, the resource estimates were evaluated in terms of how they would effect the cumulative impact assessment and the assumptions previously used. It was, therefore, determined that the basic assumptions in the FEIS were still valid.

The cumulative case scenario from the FEIS was used for the analysis in this document in order to provide consistency between the FEIS and the SEIS. This approach also complies with the court's remand for the Secretary to review the leasing program, as adopted, and to supplement the previous cumulative analysis. The SEIS is simply expanding the analysis, in terms of cumulative impacts on migratory species, already conducted in the FEIS. It is critical that consistency in assumptions and basic analysis procedures between the FEIS and SEIS is maintained. In order for the Secretary to make an informed decision, it is also that the analyses results and conclusions in each document is comparable.

The Secretary decision's can not be made only on the basis of the information in the SEIS. The Secretary, to the maximum extent practicable must obtain a proper balance between the potential discovery of oil and gas resources and the protection of the all the resources in the affected environment. If the two documents are comparable, the Secretary would have the benefit of the analysis of the resources in the proposed program in the FEIS and the new cumulative impact analysis in the SEIS to base his decision. With both documents, the Secretary has comparable information concerning the current status of the migratory species, trends in the species condition from past, ongoing, and future non-OCS and past and ongoing OCS activities, potential impacts from the 5-year program for each planning area, and the overall cumulative impacts from past, ongoing and future OCS and non-OCS activities. In addition, he has comparable information on all resources (air quality, migratory species, recreation, etc.) to evaluate the impacts associated with each alternative. Any change in assumptions or assessment methodology would render much of this information no longer comparable, and therefore, not appropriate for informed decisionmaking.

Since the publication of the draft SEIS in August 1989, resource estimates for the Chukcki Sea, Beaufort Sea and Hope Planning Areas were updated. These new resource estimates as of January 1, 1990 include the use of geological and geophysical data available and purchased through January 1, 1989. These updated resource estimates are the basis for the cumulative case resource estimate for the EISs for Lease Sales 124, and 126.

The cumulative case resource estimate for these lease sales was calculated using a probabilistic method (U.S. Geological Survey Crovelli model). [This aggregation model is different from the Probabilistic Resource Estimate - Offshore Model used for the FEIS.] The model can aggregate the resource estimates of planning areas without them having the same chance of finding oil and gas. This new resource estimate provides for a more realistic indication of potential oil and gas activities within the subregion. The resource estimate for the cumulative analysis in the Arctic Subregion is 5480 BOE with an associated marginal probability of 0.32. This method of calculating the cumulative case resource estimate for the Arctic subregion is not directly comparable with that used for the cumulative case in the FEIS and SEIS.

In addition, the resource estimate for the Northern California Planning Area was also updated as of January 1, 1990. The conditional resource estimate for this planning area is 1330 BOE with an associated marginal probability of 0.78.

One reason, these resource estimates were not considered for use in the draft and final SEIS was because of the timing of the availability of these updated estimates. At the time work commenced on the draft and final documents only preliminary resource estimates were available. At that time, these estimates were still subject to peer review and adoption by the Department. As stated by the court in its opinion it was reasonable to adopt "a cutoff time for consideration of new data in order to ensure consistency among planning areas." Different databases and economic analyses are used in making resource estimates for the 5-year program and for specific lease sales (Lease Sales 124 and 126) as well as developing the resource estimates for the Northern California Planning Area. Introducing sale-specific information or information based on different databases or economic analyses into the 5-year program might skew the comparative analysis required by the OCSLA.

**e. Exploration and Development Assumptions**

Table ILB.1-1 also identifies the level of offshore activity which may result from the exploration, the delineation of possible hydrocarbon bearing formations, and the establishment of production platforms. The estimates of infrastructure associated with these conditional resources were developed for evaluating the potential levels of impacts. As stated above, the likelihood of the listed development levels actually taking place in a planning area is based on the marginal probability of that area. However, based on necessary calculations it is highly unlikely that these events would occur for all planning areas simultaneously for this 5-year program.

The following basic assumptions are consistent with those made in the FEIS Sections IV.A.1 and IV.A.2 (pages IV.A.-3 to IV.A.-19).

The resource estimates for the cumulative case include estimates of total leased and unleased resources, and the total developed and undeveloped reserves in the planning areas.

It is assumed that all resources will eventually be developed; however, no assumption is made regarding the pace of leasing and development in future 5-year leasing programs.

The total leased and unleased resource potential and the total developed and undeveloped reserve estimates as of July 1984 will contribute to the scenario's infrastructure. Therefore, the infrastructure for the Southern California Planning Area includes existing, proposed, and hypothetical platforms and development and production wells.

Exploration, development, and production from the Pacific Planning Areas are estimated to last a total of 35-years.

Exploration, development, and production from the Alaska Planning Areas are estimated to last a total of 40 years. This period includes additional time required to bring platforms into production.

Southern California conditional oil and gas resources include developed and undeveloped reserves.

It is assumed that the conditional oil and gas resources within the Kodiak Planning Areas will be leased and developed as a result of future 5-year leasing programs. However, no assumption is made regarding the pace of leasing or development.

In response to the court's remand, an additional assumption was made for the purposes of this analysis only. It was assumed that exploration, development and production would be



distributed over the next 35- to 40-years in the Alaska and Pacific Regions. This also assumes that in every planning area there would be concurrent activity occurring as a result of the current or future 5-year programs.

#### **f. Projected Transportation and Markets**

The projected transportation and markets assumptions for the SEIS tier from the discussion in Section IV.A.3 (pages IV.A.-19 to IV.A.-25) of the FEIS. Sections IV.B.4.a, IV.B.4.b, and IV.B.4.c of the SEIS summarize these basic assumptions concerning how oil and gas production will be transported to shore and whether production will be transported by tankers or by pipelines to markets inside or outside of the planning areas. Table IV.B.4-1 presents the specific transportation mode scenarios used in the cumulative analysis. For consistency with the FEIS, the same transportation modes and assumptions were made. The allocation of the percentage of transportation by pipelines versus by tankers in a planning area is based on the assumptions presented in Section IV.B.4 and existing transportation networks.

#### **g. Summary of Cumulative Impacts**

Table II.B.1-3 indicates the cumulative impact levels on migratory species in the Alaska and Pacific OCS Regions for the 1987 Program. The cumulative impact level takes into account the effects expected from non-OCS oil and gas activities, existing oil and gas activities, as well as those from the 1987 Program. The detailed impact analyses are included in Section IV.D.

Five levels of potential impact are defined for each migratory species or group of species. These impact levels are used in the conclusion for each species analyzed in Section IV.D. Impact levels indicate the degree of intensity or severity of the impact inferred from the analysis. The five levels of impact are designated by the following qualitative terms indicating the degree of impact: very low; low; moderate; high; and very high. The term "negligible" is sometimes also used. Definitions of the impact levels may be found in Appendix A.

### **2. Alternative II - Defer Leasing in One or More Planning Areas**

#### **a. Defer St. George Basin and Navarin Basin Planning Areas**

This alternative would defer leasing in the St. George Basin and/or Navarin Basin Planning Areas in the Alaska Regions. The purpose for these deferrals is to avoid the simultaneous oil and gas development activities that were identified in Section IV.D. as causing an increase in the level of cumulative impacts on the northern fur seal and certain species of seabirds. The analysis for this alternative considers the potential for the deferrals to reduce the level of cumulative impact on these species. The analysis present in Section IV.D. provided the basis for identifying the northern fur seal and certain species of seabirds which were expected to be substantively affected by the current and future 5-year programs. The analysis further identified that the deferral of the St. George Basin and Navarin Basin Planning Areas from future leasing would reduce the cumulative impact to these species by one level or more.

It is assumed for this analysis that any planning area deferred under this alternative would also be deferred from leasing under future 5-year programs. Resource estimates and associated exploration and development assumptions for the remaining planning areas are presented in Table II.B.2-1. Assumptions concerning transportation and markets for the remaining planning areas is the same as Alternative I. With the deferral of these planning areas the expected mean number of oil spills assumed as a result of oil-related activities is presented in Table IV.B.4-3. Although no OCS development from the current and future 5-year program are assumed, the non-OCS cumulative activities within these two planning areas, as stated under Alternative I, is still presumed to occur (see Section IV.C).



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**Table II.B.2-1 Conditional Oil and Gas Resources, Reserves, and Infrastructure  
for Alternative II**

| <u>PLANNING AREA</u> | <u>OIL<br/>(MMBBL)</u> | <u>GAS<br/>(BCF)</u> | <u>MILLION<br/>BOE</u> | <u>MP<sub>HC</sub>*</u> | <u>NUMBER OF</u>                     |                                       | <u>PLATFORMS</u> |
|----------------------|------------------------|----------------------|------------------------|-------------------------|--------------------------------------|---------------------------------------|------------------|
|                      |                        |                      |                        |                         | <u>EXP. &amp;<br/>DEL.<br/>WELLS</u> | <u>DEV. &amp;<br/>PROD.<br/>WELLS</u> |                  |
| Beaufort Sea         | 1280                   | —                    | 1280                   | 0.70                    | 38                                   | 126                                   | 3                |
| Chukchi Sea          | 2680                   | —                    | 2680                   | 0.20                    | 85                                   | 263                                   | 7                |
| Hope                 | 170                    | 1810                 | 492                    | 0.02                    | 13                                   | 49                                    | 1                |
| Norton               | 640                    | 2940                 | 1163                   | 0.15                    | 45                                   | 112                                   | 4                |
| N. Aleutian          | 360                    | 2620                 | 826                    | 0.20                    | 26                                   | 80                                    | 2                |
| Shumagin             | 50                     | 1420                 | 303                    | 0.03                    | 11                                   | 30                                    | 1                |
| Kodiak               | 150                    | 2920                 | 670                    | 0.05                    | 24                                   | 66                                    | 2                |
| Cook Inlet           | 210                    | 350                  | 272                    | 0.03                    | 11                                   | 25                                    | 1                |
| Gulf of Alaska       | 540                    | 8340                 | 2024                   | 0.08                    | 63                                   | 200                                   | 5                |
| Washington/Oregon    | 180                    | 3260                 | 760                    | 0.20                    | 33                                   | 90                                    | 3                |
| N. California        | 420                    | 1860                 | 751                    | 0.60                    | 33                                   | 88                                    | 3                |
| C. California        | 300                    | 560                  | 400                    | 0.65                    | 21                                   | 46                                    | 2                |
| S. California**      | 2613                   | 4087                 | 3340                   | 1.00                    | 524                                  | 2145                                  | 48               |

\* MP<sub>HC</sub> denotes marginal probability of commercial hydrocarbons.

\*\* Includes developed and undeveloped reserves. The infrastructure for the Southern California Planning Area includes existing, proposed and hypothetical platforms and development and production wells.

Resource estimates are less an amount of resources from areas eliminated from the 5-year program because of deferrals.

Estimates of levels of exploration and development expressed in this table are based solely on the conditional resource level of the planning areas and are therefore, themselves conditional estimates.

MMBBL - Millions of Barrels

BCF - Billion Cubic Feet

BOE - Barrels of Oil Equivalent



### **b. Summary of Cumulative Impacts**

Table II.B.1-3 indicates the cumulative impact levels on migratory species in the Alaska and Pacific Regions for Alternative II. The cumulative impact level takes into account the effects expected from non-OCS oil and gas activities, existing oil and gas activities, as well as those from the remaining planning areas under this alternative. The detailed impact analyses are included in Section IV.D. With the assumption of development in all of the remaining planning areas along the migratory routes of the various species (marine mammals, fish resources, coastal and marine birds), the overall cumulative impacts range from very low to high. Under Alternative II, these migratory species will still experience impacts associated with past, ongoing and projected non-OCS activities, and past and ongoing OCS activities (see Section IV.D.) as described under Alternative I, with the exception of the northern fur seal and certain species of seabirds.

Under Alternative II, the cumulative impacts on the northern fur seal is expected to be reduced from high (i.e., for Alternative I) to moderate. The deferral of the St. George Basin and Navarin Basin Planning Areas would lower the cumulative frequency of the northern fur seal's potential exposure to large oil spills in Pribilof Islands - Unimak Pass Area (i.e., areas of high concentration of individuals). This alternative represents a significant reduction in the cumulative risk from multiple exposures to oil spills in areas of high northern fur seal concentrations. It is expected that moderate impacts to the species would result from past, ongoing and projected non-OCS and past and ongoing OCS activities.

Under Alternative II, the cumulative impacts on seabirds (particularly the alcid species) would be lower than for Alternative I. St. Matthew-Hall and the Pribilof Islands, and Unimak Pass areas support the largest concentration of the alcid species. With the deferral of the St. George Basin and Navarin Basin Planning areas, there would be fewer exposures to large oil spills and consequently, a decrease in the expected oil-related mortality. It is therefore, expected that only moderate impacts to the species would result from past, ongoing and projected non-OCS and past and ongoing OCS activities.

The deferral of the St. George Basin and Navarin Basin Planning Areas from future leasing would also result in the elimination of all potential impacts from the current and future leasing programs associated with the development of these planning areas on all components of the physical, biological, and socioeconomic environments within the planning area. Impacts to these resources which would be avoided by the deferral of the St. George Basin Planning Area are analyzed in Section IV.D.16. (pages IV.D.16-1 to IV.D.16-26 and the Navarin Basin Planning Area in Section IV.D.17 (pages IV.D.17-1 to IV.D.17-19) of the FEIS.

## **3. Alternative III - Phased OCS Development**

### **a. Phased OCS Development**

An alternative to "stagger" or "phase" OCS development in the Alaska and Pacific Region was developed to determine if changes in the timing of impact causing activities would measurably reduce the level of impact expected as a result activities associated with the current and possibly future 5-year programs. Lease sales would be held in the Chukchi Sea, Beaufort Sea, and Navarin Basin Planning Areas during the current and possibly future 5-year programs. Several factors were considered in selecting these planning areas for analysis: whether oil and gas activities were currently taking place; the likelihood of finding oil and gas; and the status of the lease sale schedule. The remaining planning areas within the regions would be deferred from leasing.

The Secretary's implementation of this alternative requires decisions beyond the scope of this 5-year program. Pursuant to section 18 of the OCSLA, as amended, 43 U.S.C. §1344, the



**Table II.B.1-3 Summary Table  
Overall Cumulative Impact Levels on Migratory Species**

| Resource Category                    | Cumulative Impact Level<br>Alternative |          |          |          |
|--------------------------------------|----------------------------------------|----------|----------|----------|
|                                      | I                                      | II       | III      | IV       |
| <b>Marine Mammals</b>                |                                        |          |          |          |
| Threatened or Endangered Cetaceans   |                                        |          |          |          |
| Gray Whales                          | Low                                    | Low      | Low      | Low      |
| Bowhead Whale                        | Low                                    | Low      | Low      | Low      |
| Fin and Humpback Whales              | Very Low                               | Very Low | Very Low | Very Low |
| Right, Blue, Sei, and Sperm Whales   | Very Low                               | Very Low | Very Low | Very Low |
| Nonendangered Cetaceans              |                                        |          |          |          |
| Beluga Whale                         | Low                                    | Low      | Low      | Low      |
| Minke Whale                          | Very Low                               | Very Low | Very Low | Very Low |
| Harbor Porpoises                     | Moderate                               | Moderate | Moderate | Moderate |
| Pinnipeds                            |                                        |          |          |          |
| Northern Fur Seal                    | High                                   | Moderate | Moderate | Moderate |
| Steller Sea Lion                     | Moderate                               | Moderate | Moderate | Moderate |
| Guadalupe Fur Seal                   | Very Low                               | Very Low | Very Low | Very Low |
| California Sea Lion                  | Very Low                               | Very Low | Very Low | Very Low |
| Ice Seals                            | Low                                    | Low      | Low      | Low      |
| Pacific Walrus                       | Moderate                               | Moderate | Moderate | Moderate |
| Northern Elephant Seal               | Very Low                               | Very Low | Very Low | Very Low |
| Harbor Seal                          | Low                                    | Low      | Low      | Low      |
| Polar Bear                           | Moderate                               | Moderate | Moderate | Moderate |
| <b>Marine and Coastal Birds</b>      |                                        |          |          |          |
| Endangered and Threatened Birds      |                                        |          |          |          |
| Arctic and American Peregrine Falcon | Low                                    | Low      | Low      | Low      |
| Short Tailed Albatross               | Low                                    | Low      | Low      | Low      |
| California Least Tern                | High                                   | High     | High     | High     |
| California Brown Pelican             | Moderate                               | Moderate | Moderate | Moderate |
| Bald Eagles                          |                                        |          |          |          |
| Alaska Region                        | Moderate                               | Moderate | Moderate | Moderate |
| Pacific Region                       | Low                                    | Low      | Low      | Low      |
| Nonendangered Birds                  |                                        |          |          |          |
| Geese                                |                                        |          |          |          |
| White-Fronted Goose                  | Moderate                               | Moderate | Moderate | Moderate |
| Emperor Goose                        | Moderate                               | Moderate | Moderate | Moderate |
| Cackling Canada Goose                | Moderate                               | Moderate | Moderate | Moderate |
| Pacific Black Brant                  | Moderate                               | Moderate | Moderate | Moderate |
| Other Geese                          | Moderate                               | Moderate | Moderate | Moderate |
| Diving Ducks                         | Moderate                               | Moderate | Moderate | Moderate |
| Waterfowl                            | Low                                    | Low      | Low      | Low      |
| Seabirds                             | Moderate                               | Moderate | Moderate | Moderate |
| Auklets, Murrelets, and other Alcids | High                                   | Moderate | High     | Moderate |
| Shorebirds                           | Low                                    | Low      | Low      | Low      |
| <b>Fisheries Resources</b>           |                                        |          |          |          |
| Salmon                               |                                        |          |          |          |
| Alaska Region                        | Very Low                               | Very Low | Very Low | Very Low |
| Pacific Region                       | Moderate                               | Moderate | Moderate | Moderate |
| Walleye Pollack                      | Very Low                               | Very Low | Very Low | Very Low |
| Steelhead Trout                      | Moderate                               | Moderate | Moderate | Moderate |
| Pacific Whiting                      | Moderate                               | Moderate | Moderate | Moderate |

Secretary's decision on the size, timing, and location of leasing activities is restricted to the 5-year period of the 1987 Program. In addition, any suspension or temporary prohibition of any operation or activity (development or production) pursuant to any lease is governed by section 5 of the OCSLA, as amended, 43 U.S.C. §1334.

For the purpose of analysis, it is assumed that no new oil and gas exploration, development, and production would occur in the deferred planning areas as a result of the past, current or future 5-year programs with the exception of the Southern California Planning Area. Under this Alternative, there would be no new leases as a result of the current and future program in the Southern California Planning Area.

The same assumptions as in Alternative I concerning resource estimates, exploration, development, production and transportation of these resources and potential oil spills are assumed for the planning areas contained in this alternative (see Sections II.B.1 and IV.B.4 and Tables II.B.1-1 and IV.B.4-1). The resource estimates for these planning areas include estimates of the total leased and unleased resources, and the total developed and undeveloped reserves in the planning areas. It is assumed that all resources will eventually be developed; however, no assumption is made regarding the size, timing and location of leasing and development in future 5-year programs.

Under Alternative III only three of the planning areas in the Alaska Region would be considered for leasing. Resource estimates and associated exploration and development assumptions are presented in Table II.B.3-1. Based on the development and production of the conditional resources for these three planning areas, the assumed number of oil spills expected as a result of oil-related activities is presented in Table IV.B.4-4. Although no OCS development is assumed in several of the planning areas, the non-OCS cumulative activities within all the planning areas, as stated under Alternative I, is still presumed to occur (see Section IV.C).

#### b. Summary of Cumulative Impacts

Table II.B.1-3 indicates the cumulative impact levels on migratory species in the Alaska and Pacific Regions for Alternative III. The cumulative impact level takes into account the effects expected from non-OCS oil and gas activities, existing oil and gas activities, as well as those from the remaining planning areas under this alternative. The detailed impact analyses are included in Section IV.D. With the assumption of development in the Chukchi Sea, Beaufort Sea, and Navarin Basin Planning Areas along the migratory routes of the various species (marine mammals, fish resources, coastal and marine birds), the overall cumulative impacts range from very low to high. Under Alternative III, these migratory species will still experience various levels of cumulative impacts associated with past, ongoing and projected non-OCS activities, and past and ongoing OCS activities (see Section IV.D.) when compared to Alternative I, with the exception of the northern fur seal.

Under Alternative III, the cumulative impacts on the northern fur seal are expected to be reduced from high to moderate. The deferral of eleven planning areas, especially the St. George Basin Planning Area, would lower the cumulative frequency of the northern fur seal's potential exposure to large oil spills in Pribilof Islands - Unimak Pass area (i.e., areas of high concentration of individuals). This alternative represents a reduction in the cumulative risk from multiple exposures to oil spills in areas of high northern fur seal concentrations. However, impacts associated with the development and transportation of oil from the Navarin Basin Planning Area is still expected to effect the northern fur seal.

The deferral of leasing in the remaining planning areas (St. George Basin, Hope, North Aleutian, Shumagin, Kodiak, Cook Inlet, Gulf of Alaska, Washington/Oregon, Northern, Central, and Southern California) in the Alaska and Pacific Regions would also result in the



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**Table II.B.3-1 Conditional Oil and Gas Resources, Reserves, and Infrastructure  
for Alternative III**

| <u>PLANNING AREA</u> | <u>OIL<br/>(MMBBL)</u> | <u>GAS<br/>(BCF)</u> | <u>MILLION<br/>BOE</u> | <u>MP<sub>HC</sub><sup>*</sup></u> | <u>NUMBER OF</u>                     |                                       | <u>PLATFORMS</u> |
|----------------------|------------------------|----------------------|------------------------|------------------------------------|--------------------------------------|---------------------------------------|------------------|
|                      |                        |                      |                        |                                    | <u>EXP. &amp;<br/>DEL.<br/>WELLS</u> | <u>DEV. &amp;<br/>PROD.<br/>WELLS</u> |                  |
| Beaufort Sea         | 1280                   | —                    | 1280                   | 0.70                               | 38                                   | 126                                   | 3                |
| Chukchi Sea          | 2680                   | —                    | 2680                   | 0.20                               | 85                                   | 263                                   | 7                |
| Navarin              | 4800                   | 5840                 | 5839                   | 0.27                               | 179                                  | 569                                   | 14               |

\* MP<sub>HC</sub> denotes marginal probability of commercial hydrocarbons.

\*\* Resource estimates are less an amount of resources from areas eliminated from the 5-year program because of deferrals.

Estimates of levels of exploration and development expressed in this table are based solely on the conditional resource level of the planning areas and are therefore, themselves conditional estimates.

MMBBL - Millions of Barrels

BCF - Billion Cubic Feet

BOE - Barrels of Oil Equivalent

elimination of all potential impacts as a result of the exploration, development, and production activities associated with OCS development as a result of the current and future 5-year programs on all components of the physical, biological, and socioeconomic environment within the planning area. Impacts to these resources which would be avoided by the deferral of these planning areas are analyzed in Section IV.D. of the FEIS.

#### **4. Alternative IV - No Action (Cancel the 1897 Program in the Alaska and Pacific Regions)**

##### **a. No Action (Cancel the 1987 Program in the Alaska and Pacific Regions)**

The evaluation of a "no action" alternative is required by the regulations implementing NEPA (40 CFR 1502.14(d)). For the purpose of this analysis only, this alternative assumes that the remaining lease sales within the Alaska and Pacific Regions will be deferred for the remainder of the period covered by the 5-year program approved by the Secretary on July 2, 1987. This alternative would constitute the most extreme level of mitigation to eliminate simultaneous development.

Under this alternative the only Federal oil and gas activities in the Pacific and Alaska Regions would be from previously leased areas. The oil and gas resources that would have become available as a result of the current 5-year program would be foregone. Therefore, that amount of energy would have to be made up by either alternative energy sources or conservation.

##### **b. Summary of Cumulative Impacts**

Table II.B.1-3 indicates the cumulative impact levels for Alternative IV on migratory species in the Alaska and Pacific OCS Regions. The cumulative impact levels for this alternative takes into account the effects expected from non-OCS oil and gas activities, existing oil and gas activities. The detailed impact analyses are included in Section IV.D

Existing impact producing factors or agents (associated with past, ongoing and projected non-OCS activities, and past and ongoing OCS activities) are currently causing a moderate level of impact to the northern fur seal and certain species of seabirds while the overall level of cumulative impacts with the addition of the current and future programs is high. The deferral of the development and transportation of oil resources within all the planning areas within the Pacific and Alaska Region (specifically the St. George Basin and Navarin Basin Planning Areas) during this and future 5-year programs would significantly lower the cumulative frequency of exposure to oil spills. Therefore, this alternative would reduce the impacts to the northern fur seal and certain species of seabirds from high to moderate.

The deferral of leasing in all the planning areas in the Alaska and Pacific Regions would also result in the elimination of all potential impacts as a result of the exploration, development, and production activities on all components of the physical, biological, and socioeconomic environment within the planning area. Impacts to these resources which would be avoided by the deferral of these planning area are analyzed in Section IV.D. of the FEIS.

#### **C. Comparison of Alternatives**

Table II.B.1-3 compares the cumulative impact levels for Alternative I, II, III and IV on migratory species in the Alaska and Pacific OCS Regions. If the deferral of the St. George Basin and Navarin Planning Areas (Alternative II - Defer Leasing in One or More Planning Areas) was selected by the Secretary, it would nearly eliminate the potential for large oil spills in the St. George Basin and Navarin Basin Planning Areas (some oil spill risk remains from transportation through these areas). Most of the oil-related impacts from activities in St. George Basin and Navarin Basin Planning Areas would not occur. This reduction in impacts occurs because the conditional mean resources within those basins (St. George Basin -



1690 MMBBL of oil and 15760 BCF of gas, and Navarin Basin 4800 MMBBL of oil and 5840 BCF of gas) would not be leased and developed. The potential impacts associated with the level of offshore activity which may result from the exploration, the delineation of the possible hydrocarbon bearing formations, and the establishment of production platforms would be eliminated. Only that amount of the conditional mean hydrocarbon resource expected to be developed as a result of leasing in the St. George Basin and Navarin Basin Planning Areas would be forgone.

Among the migratory species that are expected to benefit from deferral of the St. George Basin and Navarin Basin Planning Areas from current and future programs are seabirds and northern fur seals. For nearly every species, the level of cumulative impact expected without current and future 5-year programs was expected to be the same as the level of impact with the proposal. Differences between the cumulative impacts expected under Alternative II as compared with Alternative I depends upon individual species' sensitivity to presumed future activities (including accidental spills) that could occur in the St. George Basin and Navarin Basin Planning Areas.

Impacts to many of the migratory species analyzed would be lower under Alternative II given the relatively lower level of OCS activity involved. However, the magnitude of the difference in effects is not great enough to change the expected levels of impact, except of certain seabirds and the northern fur seal. The principal reason is that the 5-year leasing program generally represents only a small portion of the cumulative activity (including accidental oil spills) that is estimated to occur over the next 35 to 40 years in most areas of the Alaska and Pacific Regions. Thus except for the reduction in the level of impact for the northern fur seal and certain seabirds, no differences in the cumulative impact levels are expected between Alternative I and Alternative II.

If the Secretary selects the alternative to stagger or phase OCS development (Alternative III - Phased OCS Development) it would eliminate from leasing the oil and gas resources in eleven of the 14 planning areas, and therefore, any potential exploration, development, and production of oil and gas in these areas. The potential impacts associated with the level of offshore activity which may result from the exploration, the delineation of the possible hydrocarbon bearing formations, and the establishment of production platforms would also be eliminated. The conditional mean hydrocarbon resources (See Table II.B.1-1) expected to be developed as a result of leasing in the St. George Basin, Hope, North Aleutian, Shumagin, Kodiak, Cook Inlet, Gulf of Alaska, Washington/Oregon, Northern, Central and Southern California Planning Areas would be forgone.

Most migratory species evaluated in the SEIS would be expected to benefit to some degree from deferring these areas. However, as the analysis in Section IV.D. indicates, there is expected to be no measurable difference in cumulative impact levels, except for the northern fur seal. The analysis in Section IV.D. shows that there is little difference in the expected cumulative impact on any species with or without the current and future 5-year programs.

Under Alternative III, the cumulative impacts on the northern fur seal are expected to be reduced from high to moderate. The deferral of the nine planning areas, especially the St. George Basin Planning Area would lower the cumulative frequency of the northern fur seal's potential exposure to large oil spills in Pribilof Islands - Unimak Pass area (i.e., areas of high concentration of individuals). However, impacts associated with the development and transportation of oil from the Navarin Basin Planning Areas is still expected to effect the northern fur seal.

Under Alternative III the assumed number of oil spills is reduced by 19 as compared with Alternative I, impacts to certain species of seabirds located in the vicinity of St. Matthew, Hall



and Pribilof Islands and the Unimak Pass areas would still be subject to oil spills as a result of the potential development, production, and the transportation of oil from the Navarin Basin Planning Area.

Impacts to many of the migratory species analyzed would be lower under this alternative given the significantly lower level of OCS activity involved. However, the magnitude of the difference in effects is not great enough to change the expected levels of impact, except for the northern fur seal. The principal reason is that the 5-year leasing program generally represents only a small portion of the cumulative activity (including accidental oil spills) that is estimated to occur over the next 35 to 40 years in most areas of the Alaska and Pacific Regions. Thus except for the reduction in the level of impact for the northern fur seal, no differences in the cumulative impact levels are expected between Alternative I and Alternative III.

If the deferral of the remaining lease sales in the current 5-year program (Alternative IV - No Action) within the Alaska and Pacific Regions was selected, it would also reduce the risk of multiple oil spills contacting the northern fur seal and certain species of seabirds from development and production in the St. George Basin and Navarin Basin Planning Areas. This alternative would reduce, and in some cases eliminate, the risk of oil spill associated with the development of the conditional mean resource estimates (See Table II.B.1-1) for the planning areas which have remaining sales scheduled. The potential impacts associated with the level of offshore activity necessary to develop the possible hydrocarbon bearing formation would also be eliminated. But, Alternative IV would not reduce significantly the level of impact currently being experienced by migratory species in the other planning areas in the Alaska and Pacific Regions. In addition, all the oil and gas that would become available as a result of the current 5-year program would be forgone (See Table II.B.1-1). This amount of energy would have to be made up by oil imports, alternative energy sources or conservation (see Appendix C in the FEIS).

# **CHAPTER III**

## **DESCRIPTION OF MIGRATORY SPECIES**



### **III. Description Of Migratory Species**

#### **A. Introduction**

This chapter discusses the current population status and general migratory routes of selected migratory species in the Alaska and Pacific coastal and offshore regions. The Pacific Region extends from the United States-Mexico Border to the United States-Canada border. The area is subdivided into four administrative planning areas (see Figure III.A-1). A detailed description of the affected environment of the coastal and offshore regions of the planning areas in the Pacific Region is contained in Section III.C. (pages III.C.-1 to III.C.-124) of the FEIS for the Proposed 5-Year Program.

The Alaska Region is divided into 3 subregions: the Arctic, the Bering Sea, and the Gulf of Alaska. The subregions have been further divided into 15 administrative planning areas (see Figure III.A-2). A detailed description of the affected environment of the coastal and offshore regions of the planning areas in the Alaska Region is contained in Section III.D. (pages III.D.-1 to III.D.-100) in the FEIS for the Proposed 5-Year Program.

#### **B. Marine Mammals**

##### **1. Threatened or Endangered Cetaceans**

###### **a. Bowhead Whale**

Individuals of the estimated 7,800 western arctic stock of bowhead whales (Zeh, Reilly, and Sonntag, 1988) migrate through a number of Alaska OCS Region planning areas. Summer-feeding grounds are located in the Canadian Beaufort Sea, and wintering areas are present in the Bering Sea.

In recent years, population estimates have risen dramatically, although the reason behind this increase is more likely due to better censusing techniques than to a rapidly increasing population. The current population estimate may be about 40 percent of the historic population level prior to commercial exploitation (based upon numbers cited by Braham (1984b)). The species presently appears to be much more abundant than at the close of the commercial whaling period, just after the turn of the century, when it was estimated that there were probably not less than 1,000 animals. Commercial whaling during the latter half of the 19th century had decimated the bowhead whale population, and the cessation of commercial bowhead whaling due to the collapse of the market for whale oil and baleen allowed the population to slowly recover. The species is now protected from commercial whaling, although there has continued to be a subsistence hunt by Alaska Natives. This subsistence hunt probably slows the population growth somewhat, but does not appear to result in a population decline.

After summer feeding in the Canadian Beaufort Sea, bowheads begin moving westward in August into Alaskan waters. Bowheads continue to feed intermittently as they migrate across the Alaskan Beaufort Sea, primarily during September and October. Conditions can vary during the fall migration from open water to over 90 percent ice coverage. Most bowheads migrate through water depths ranging from 10 to 50 meters (Ljungblad, Moore, and Van Schoik, 1984a).

Data on the bowhead fall migration through the Chukchi Sea is limited; however, it appears that before they move south into the Bering Sea, most bowheads cross the Chukchi Sea in a broad front from Point Barrow to the northern coast of the Chukotsk Peninsula (Ljungblad, Moore, and Van Schoik, 1984b). Most whales enter the Bering Sea by the first part of November, in advance of winter pack ice.



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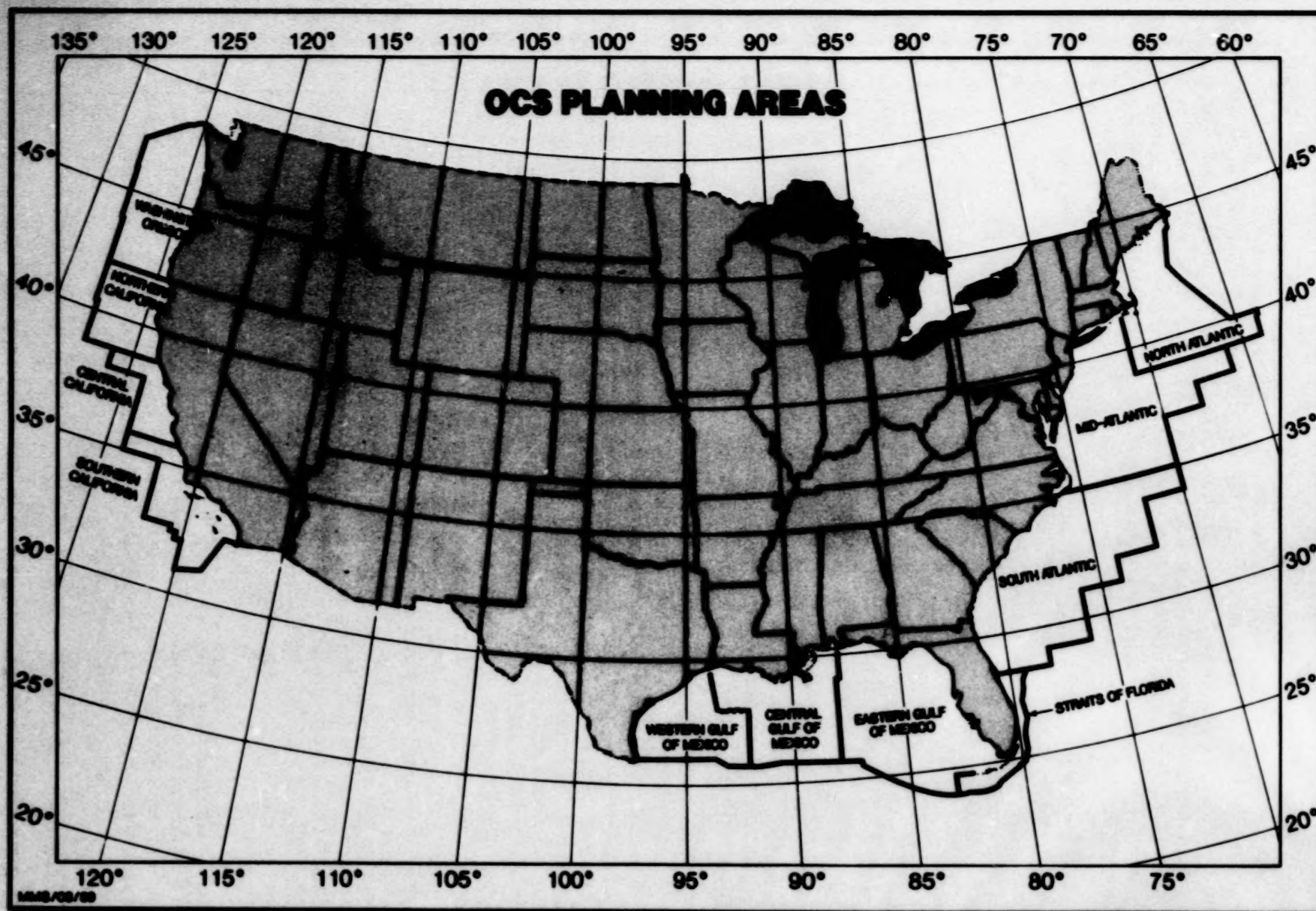


**Figure III.A-1 Outer Continental Shelf Planning Areas**

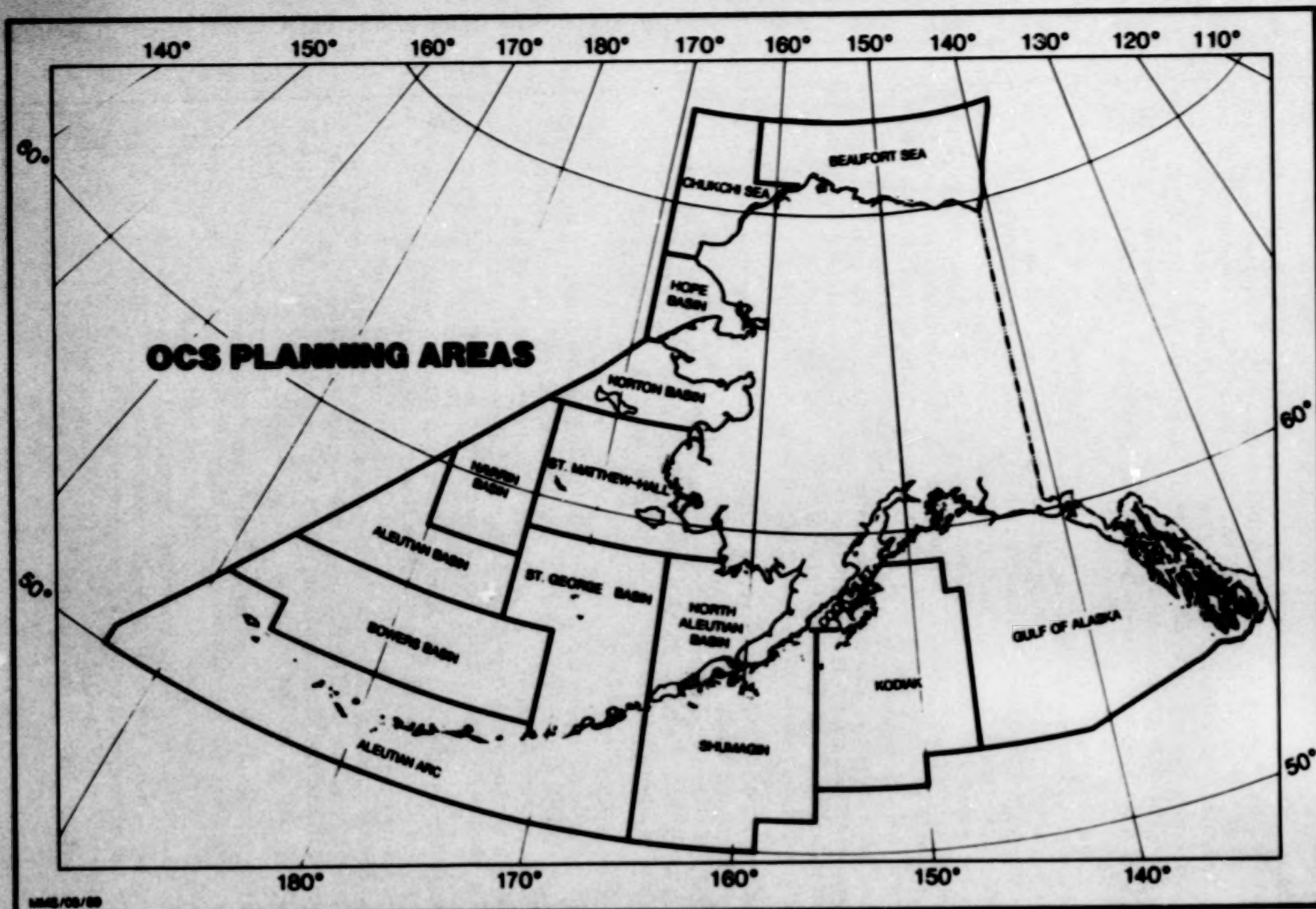


Figure III.A-2 Alaska Region Planning Areas



Though not well-defined, the bowheads' winter range appears to be in the central and western Bering Sea, from south and west of St. Lawrence Island to the ice front (Brueggeman, 1982; Brueggeman, Grotefendt, and Erickson, 1984). The bowheads' northward spring migration appears to be timed with the ice breakup, usually beginning in April (Braham, Krogman, and Carroll, 1984). In the Chukchi Sea, they follow leads in the flaw zone from outer Kotzebue Sound to Barrow. After passing Barrow from April through mid-June, they move through offshore leads in an easterly direction. East of Point Barrow, the lead systems divide into numerous branches that vary in location and extent yearly. Bowheads arrive at their summer feeding grounds in the vicinity of Banks Island/Amundsen Gulf about late May to June (Fraker, 1979).

Bowheads apparently feed throughout the water column (Wursig et al., 1984), and they have been observed feeding during their spring and fall migration. Food items most commonly found in the stomachs of harvested bowheads include euphausiids, mysids, copepods, and amphipods (Lowry and Frost, 1984). Areas to the east of Barter Island appear to be used regularly for feeding as bowheads migrate slowly westward across the Beaufort Sea (Thomson and Richardson, 1987), and in some years sizeable groups of bowheads have been seen feeding east of Point Barrow near the Plover Islands (Braham, Krogman, and Carroll, 1984; Ljungblad, et al., 1985). Carbon isotope analysis of bowhead baleen has indicated that a significant amount of feeding may occur in wintering areas (Schell, Saupe, and Haubenstock, 1987). Bowheads were also observed feeding in the spring in the vicinity of Point Barrow during 1985 and 1986, indicating that bowheads will opportunistically feed in this area when food is available (Carroll and George, 1985; George et al., 1987).

Bowhead mating and calving appear to occur during the spring migration. Late winter is the most probable mating season, when most of the population is located in the Bering Sea (Nerini et al., 1983). However, mating behavior has also been reported north of Point Barrow (Everitt and Krogman, 1979). The peak of calving probably occurs in May, although the calving season could extend in some years from late March until early August (Nerini et al., 1983).

#### b. Gray Whale

The eastern Pacific gray whale stock is estimated at approximately 21,000 individuals (Brewick et al., in press). Due to commercial whaling, this stock was severely depleted by the early 1900's; however, under legal protection, the eastern Pacific gray whale stock has recovered to previous pre-exploitation numbers (Rice, Wolman, and Braham, 1984). In recent years, the population has grown by an estimated 2.5 percent per year (Reilly, Rice, and Wolman, 1983).

Major gray whale summer feeding areas exist in the northern Bering and southern Chukchi Seas. Smaller numbers of whales summer in the Beaufort and eastern Siberian Seas, in nearshore waters and estuaries along the northern coast of the Alaska Peninsula, and in the waters off British Columbia, Oregon, and northern and central California. While at their feeding grounds, grays are often sighted singly; however, several hundred may be distributed within a few dozen square kilometers in the rich food areas of the northern feeding grounds (Leatherwood, Reeves, and Foster, 1983).

The southbound migration from summer feeding areas generally begins in mid-October (Johnson et al., 1981), although Moore and Ljungblad (1984) recorded gray whales in the northern waters of the Bering Sea until at least November. Gray whales depart the Bering Sea through Unimak Pass, mainly in November and December. The whales migrate near shore along the coast of North America from Alaska to central California. Off northern and central California, the major pulse of southbound migration occurs in late December through January. Gray whales travel considerably closer to shore than other species. Most of the southbound animals are sighted within 3.7 km of the mainland. After passing Point Conception, California,

the majority take a more direct offshore route across the southern California Bight to northern Baja California.

Feeding is not a major activity of migrating gray whales. Little if any food is consumed during the southbound migration. There are some reports that whales do some feeding just prior or on the wintering grounds. Whales without calves have been reported to lose .2 to .4 percent of body weight per day during the migration. Feeding generally does not resume as a major activity until animals again reach southeastern Alaska (Rice et al., 1984).

Of the few animals that have occasionally been observed feeding, they tend to do so on bottom fauna mostly at the mouths of rivers and estuaries (Nerini, 1984). Recent studies have identified depressions in area offshore northern California where significant gray whale feeding has occurred (Cacchione et al. 1987). Others have also reported occasional gray whale feeding activities during the migration and in the shallow breeding lagoons in Baja California (Sund 1975; Sprague et al., 1978).

A large portion of the gray whale population uses the west coast Baja lagoons or nearby waters during the winter (8,000 in 1981); gray whale densities in these areas far exceed those in any other part of their range. From January to March, gray whales are present in major calving and breeding areas along the outer coast of Baja California including Ojo de Liebre (Scammon's) Lagoon, Guerrero Negro Lagoon, San Ignacio Lagoon, and Magdalena Bay and its adjacent protected waters (Rice and Wolman, 1971). Calves are born from early January to mid-February.

The majority of gray whales begin their northbound migrations around March, although some whales apparently start earlier (Braham, 1984a), beginning as early as mid-January and continuing through late June. In California, the migration occurs in two phases: first, those animals "unencumbered with newborns," then mothers with young calves. In northern and central California, the northbound gray whale migration occurs from February to June. After traveling north along the coasts of Oregon, Washington, British Columbia, and the Gulf of Alaska, gray whales enter the southeastern Bering Sea through Unimak Pass in spring and early summer (March through June). Migrating whales follow the west coast of Unimak Island and continue their coastal migration through the North Aleutian Shelf area (within 1-2 km of shore) until they near Egegik Bay. There they begin to head across northern Bristol Bay, maintaining a distance of 5 to 8 km from shore (DOI, MMS, 1985). Some feeding occurs along the west coast of Canada, in the Gulf of Alaska, and in the Bristol Bay area (Gill and Hall, 1983; Braham, 1984). Once gray whales reach Nunivak Island, they head offshore to their primary feeding grounds off St. Lawrence Island, in the Chirikov Basin, and in the southern Chukchi Sea.

During summer, gray whales (like the other great whales) build up fat on which they apparently survive during the fall, winter, and spring. Gray whales are primarily bottom feeders, selecting high biomass areas in their northern feeding grounds. The stomach contents of whales taken by Soviet whalers in one area of the Chirikov Basin consisted of 95 percent sedimentary amphipods, usually 13 to 27 millimeters (mm) long (Nerini, 1984). In addition to benthic suction feeding, the gray whale is also capable of feeding on pelagic prey by skimming and engulfing, as reported by several authors in Nerini (1984). This mode of feeding may be used in areas where mobile scavenging arthropods are present, or in Baja California where stomach contents have contained bait fish (Nerini, 1984).



### c. Fin and Humpback Whales

#### (1) Fin Whale

Fin whales range from subtropical to arctic waters. It is estimated that, prior to the advent of modern whaling, the North Pacific population ranged from 42,000 to 45,000 individuals. By the time commercial whaling had ended, the population had been reduced to an estimated 14,620 to 18,630 individuals (Ohsumi and Wada, 1974). North Pacific fin whales have been protected from commercial whaling since 1976; as a result, the population should be increasing. However, recent sighting data have been slight and difficult to interpret, and it appears that the population remains at less than half its pre-exploitation level (Mizroch, Rice, and Breiwick, 1984b).

The summer distribution of fin whales extends from central California into the Chukchi Sea. In Alaskan waters, some whales spend the summer feeding in the Gulf of Alaska, while others migrate further north. Fin whales present in the Bering Sea divide into two groups; one follows the shelf-break zone to Cape Navarin (mainly mature males and females without calves), and a second group (mostly lactating females and juveniles) remains in the region north of Unimak Pass (Morris, 1981). Fin whales feed throughout the Bering and Chukchi Seas from late June through October. Other summer feeding concentration areas are located along upwelling fronts and include the areas southwest of St. Matthew Island and south of the Aleutian Islands (Nasu, 1966). From May to August, concentrations of fin whales also occur from 144° to 150° W. longitude and from 56° to 59° N. latitude, including parts of Portlock Bank, and in an area from the Shumagin Islands to the Trinity Islands. Fin whales occur primarily in high-relief areas where biological productivity is probably high (Brueggeman et al., 1988).

Fin whales winter in subtropical to temperate waters. The southward migration begins in September and continues through November. By November, most fin whales have arrived at their winter grounds off southern California. The winter distribution (November to January) in the eastern North Pacific extends from central California to Baja California (approximately 20° N. latitude), where much of the population is believed to winter far offshore (Leatherwood et al., 1982). Brueggeman, Grotefendt, and Erickson (1984) found that a few fin whales remained during the winter in Alaska's Navarin Basin.

The northward migration begins in spring. The fin whale was once the most abundant large baleen whale off California in spring and summer, with a peak abundance in May or June. Migrating whales enter the Gulf of Alaska from early April to June.

Fin whales usually breed and calve in the warmer waters of their winter range. Breeding can occur during any season, but the peak occurs between November and February (Tomilin, 1957; Ohsumi, Nishiwaki, and Hibiya, 1958).

Fin whales are opportunistic feeders, taking euphausiids, copepods, fish, and squid. They consume primarily euphausiids, which form large swarms over the continental shelf margin, where upwelling occurs (Nemoto, 1970). Fin whales also take a wide variety of fish, including herring, capelin, pollock, and Arctic cod. Their diet appears to change from year to year and from location to location, depending on whether euphausiids, copepods, fish, or squid are most abundant (Lowry et al., 1982).

#### (2) Humpback Whale

The present North Pacific humpback whale population is estimated at between 1,200 and 2,100 individuals (Rice 1978; Darling and Morowitz, 1986). Prior to commercial whaling, an estimated 15,000 humpbacks inhabited the North Pacific. About 28,000 humpbacks were taken by whalers, thus reducing the population to about 1,000 (Rice, 1978). However, under protection from whaling, the population may be slowly increasing.



Summer feeding grounds extend from central California and Washington State through southeast Alaska and the Aleutian Islands to the Bering Sea and southern Chukchi Sea (Wolman, 1978; Dohl, 1983). In the Bering Sea, most sightings have been recorded near Unimak Pass, the eastern Aleutian Islands, and the outer shelf east of the Pribilof Islands. In the Gulf of Alaska, concentration areas include the Portlock and Albatross Banks (off Kodiak Island) and west to the eastern Aleutians, Prince William Sound, and the inland waters of southeastern Alaska (Berzin and Rovnin, 1966).

In California, humpbacks use the Farallon Basin as a spring through fall feeding ground. The fall migration may begin as early as September for humpbacks in the northern Bering Sea (Berzin and Rovnin, 1966) and as late as December for those in the Gulf of Alaska and California (Fiscus et al., 1976; Dohl, 1983).

Humpbacks are known to winter in three areas: along central Mexico and Baja California; in the Hawaiian Islands; and in the western Pacific around the Mariana, Bonin, and Ryukyu Islands, and Taiwan. Most humpbacks that summer in southeast Alaska and Prince William Sound migrate to wintering areas off Hawaii (Darling and McSweeney, 1983). Whales that summer in central California appear to winter off Baja Mexico (Dohl, 1983; Urban et al., 1987). Photo-identification also indicates that some humpbacks migrate between winter/breeding grounds in Mexico and summering areas in southeast Alaska.

During the spring, humpback whales migrate north from overwintering areas to summer areas in the Bering Sea, the Gulf of Alaska, and the Pacific coast of North America. Humpbacks have been sighted as early as March off southeast Alaska, and in May off the Portlock and Albatross Banks and in Prince William Sound in May. They reach Bristol Bay (Cape Newenham area) in June and enter the Chukchi Sea from July to September (Tomilin, 1957).

Breeding and calving occur on the wintering grounds. Most births occur between January and March (Johnson and Wolman, 1984).

Humpbacks feed on crustaceans such as euphausiids, amphipods, mysids, and small schooling fish including Pacific herring, capelin, anchovies, sardines, cod, and sand lance (Tomilin, 1957; Wolman, 1978; Wing and Krieger, 1983). They are thought to feed mainly during the summer period, since stomachs examined during the winter months in coastal or subtropical waters of both hemispheres are generally empty (Wolman, 1978). Feeding occurs at the surface or in the midwater regime. Humpbacks capture food items by engulfing their prey or by laterally feeding at the surface.

#### d. Right, Blue, Sei, and Sperm Whales

##### (1) Right Whale

In the eastern Pacific Ocean, right whales occur from Alaska and the Aleutian Islands south to Oregon and California (Tomilin, 1957). Right whales were hunted nearly to extinction by commercial whalers during the 1800's; despite protection, the population has yet to show any signs of recovery. Over the past 30 years, 32 to 36 right whales have been sighted in the central North Pacific-Bering Sea, and 21 to 26 on the west coast of North America south of Kodiak, Alaska. The current size of the North Pacific population is unknown. Due to limited sighting information, no reliable estimate is possible; however, the sighting records suggest that there are probably only a few hundred individuals remaining.

Historic whaling records indicate that right whales were taken from April through September in the Gulf of Alaska, and from August through September in the Bering Sea/Bristol Bay area. Between spring and fall (April-September), right whales are generally found north of 50° N. latitude, particularly in the Gulf of Alaska, and roughly between 145° W. to 151° W. longitudes

(Berzin and Rovnin, 1966). When in the Bering Sea, the whales are likely to be found in an area bounded by Atka, St. Matthew, and Nunivak Islands (Berzin and Rovnin, 1966).

The migration routes and winter distribution of the right whale population is unknown and subject to speculation. After examining virtually all available sighting data, Scarff (1986) hypothesized that right whales summering in the eastern North Pacific mate, calve, and overwinter in the mid-Pacific or western North Pacific. A few individuals overwinter off the Pacific coast of North America.

Right whales do feed primarily on calanoid copepods, and secondarily on euphausiids, which they skim from the upper portions of the water column.

## (2) Blue Whale

The most recent estimate of the North Pacific blue whale population is about 1,600 individuals (Gambell, 1976); however, there has been little new information on blue whale abundance since hunting ceased in 1967. It is estimated that prior to exploitation by commercial whaling there were about 4,900 blue whales in the North Pacific. There have been numerous sightings in the last several years off Mexico and California, but no useful census data are available for population assessment. There is no evidence that the blue whale stocks in the North Pacific are recovering, given the following factors: the relative scarcity of blue whales based on opportunistic sightings, the low population estimates relative to their initial abundance, and the low intrinsic rate of increase noted for this and other baleen whale populations, to date, (Mizroch, Rice, and Breiwick, 1984a).

Summering blue whales are present from the waters off California to Alaska. In southern California, Dohl et al. (1978) observed a total of 83 animals in 29 sightings. Thirty-five percent of the animals were recorded in the spring quarter (April, May, June), 49 percent in the summer quarter, and 16 percent in the fall quarter. No animals were sighted during the winter. The greatest number of sighted blue whales traversed the outer edge of the southern California Bight between the Santa Rosa-Cortes Ridge and Tanner-Cortez Banks, especially between July and October. They also were frequently sighted in waters near the southern California Channel Islands during the same months, occasionally within 28 km of the mainland.

The blue whale is a common summer/autumn visitor to central and northern California; although, in some years, whales may arrive as early as May and remain until mid-December (Dohl, 1987). During 1980 to 1983 in northern and central California, most blue whale sightings occurred in waters over the continental shelf and slope (45-999 fathoms); all but one of the 66 animals were south of Fort Bragg (Dohl, 1984). Blue whales also have been seen "far off the coast of northern California . . . At least some of their movements, then must occur along pelagic routes." (Leatherwood et al., 1982). Blue whales are most commonly sighted off the Oregon coast from May through June, and August through October (Rice, 1974).

Modern whaling data indicate that blue whale abundance peaks in the eastern Gulf of Alaska in July and near the eastern Aleutian Islands in June (Rice, 1974). Compared to other large cetaceans, the blue whale migration is more limited in northern waters. Marking studies revealed little apparent movement of blue whales while they were on their feeding grounds (Morris, Alton, and Braham, 1983). The species occur in relative abundance in a narrow area just south of the Aleutian Islands from 160° W. to 175° W. longitude (Berzin and Rovnin, 1966; Rice, 1974). Also, it is distributed in an area north of 50° N. latitude, extending from southeastern Kodiak Island across the Gulf of Alaska and from southeast Alaska to Vancouver Island (Berzin and Rovnin, 1966). According to whaling records, large concentrations of this species once occurred in two areas: (1) the northern part of the Gulf of Alaska southwest of Prince William Sound in the Portlock Banks area (Nishiwaki, 1966), and (2) to a lesser extent,



in an area west of the Queen Charlotte Islands and southeast Alaska (Berzin and Rovnin, 1966). Recent blue whale sightings in Alaskan waters have been scant.

Blue whales usually begin to migrate south out of the Gulf of Alaska by September (Berzin and Rovnin, 1966). Migration routes are thought to be along the western coast of North America. The North Pacific blue whale population winters from the "open waters of the midtemperate Pacific south at least to 20° N. latitude." Blue whales occur up to 1,300 to 2,800 km offshore of Central America and at least as far south as Panama (Leatherwood et al., 1982).

According to Berzin and Rovnin (1966), the northward spring migration of the North Pacific population begins in April through May, with whales traveling along the American shore of the Pacific. Blue whales are sighted off Baja California and the Mexican mainland in February, with peak densities apparently occurring in April.

Mating and calving are believed to take place over a 5-month period during the winter (Mizroch, Rice, and Breiwick, 1984a).

On their summer range, the principal food of blue whales is small euphausiid crustaceans (*Euphausia pacifica* and *Thysanoessa spinifera*) (Nemoto, 1959; Berzin and Rovnin, 1966) which they obtain by engulfment.

### (3) Sei Whale

The most recent estimates of the North Pacific sei whale population range from 22,000 to 37,000 individuals. This is down from the pre-exploitation population estimate of 45,000 (Ohsumi and Fukuda, 1975). Commercial whaling catches of sei whales in the North Pacific and Bering Sea rose sharply during the 1960's and then dropped sharply thereafter. Despite protection from commercial whaling, there are no indications of population trends for this species.

Sei whales are more common in pelagic temperate waters and only occasionally venture into the Bering Sea. They apparently migrate to lower latitudes in winter and to higher latitudes in summer. Sei whales have been reported in the Gulf of Alaska and along the Aleutian Chain during the summer (Wada, 1981), with most found south of the Aleutians and off the eastern Kamchatka Peninsula to the Commander Islands (Nasu, 1963).

The southward migration begins in August or September. During late summer and early fall, sei whales are usually present in considerable numbers off central California. During January through March, most are found between 20° N. to 23° N. latitudes, but they range from Point Piedras Blancas, California (35° N. latitude), to the Revillagigedo Islands off Baja California (18° N. latitude).

Sei whales breed and calve in the warmer waters of their winter range. Most breeding occurs from October to March, with a peak in late December; calving occurs from September to February, with a peak in November (Masaki, 1976).

Sei whales feed while skimming surface waters and generally do not dive deeply. Kawamura (1980) summarized the foods of approximately 12,000 sei whales collected in the North Pacific and found that copepods comprised 83 percent of the diet, followed by euphausiids (13%), fish (3%), and squid (1%).

### (4) Sperm Whale

The number of sperm whale individuals in the North Pacific population large enough to be commercially exploitable (males aged 11 years and older and females aged 10 and over) has been estimated at around 274,000 (International Whaling Commission, 1979). This is in comparison to an estimated initial (1910) population size of 310,000. Commercial whaling took



many sperm whales. A worldwide average of over 20,000 sperm whales were taken annually between 1956 and 1976, thus resulting in a population decline. Although commercial whaling for sperm whales has ceased in the North Pacific, there have been no recent population trends identified for this species.

In the eastern North Pacific, sperm whales range from the equator occasionally north to 62° N. latitude and west to Cape Navarin in the Bering Sea. Sperm whales generally are found in waters of 200 m or deeper, and typically only males venture north of 50° N. latitude. Sperm whales migrate poleward in spring and summer, returning to the temperate and tropical portions of their range in the fall.

During the summer months, male sperm whales are present in the Bering Sea, where they are generally encountered singly or in pairs. Summer feeding grounds occur off British Columbia, the Gulf of Alaska, the Alaska Peninsula, and the Aleutian Islands. In the Bering Sea, sperm whales most commonly occur along the shelf break between the Pribilof Islands and Cape Navarin. Ohsumi (1965) and Best (1975) estimated that 40 to 60 percent of the mature males (20% to 30% of the entire mature population) spend the summer months at high latitudes (the Bering Sea and Aleutian Islands areas). Fall migrations begin in September, and most whales have left Alaskan waters by December.

Off central and northern California, sperm whales are present year-round in offshore waters. Peak abundance has been observed during May through June, and August through November as the whales migrate through the area (Gosho, Rice, and Breiwick, 1984). The wintering grounds are generally south of 35° N. latitude, between the Hawaiian Islands and California. Migration northward to Alaskan waters begins in March and continues through May (Berzin and Rovnin, 1966).

Breeding occurs during the spring and early summer (April through August). Calves are born after a gestation period of about 15 months (Gosho, Rice, and Breiwick, 1984).

Sperm whales feed predominantly on squid and fish, on the bottom as well as in midwater regions.

## **2. Nonendangered Cetaceans**

### **a. Beluga Whale**

The beluga whale is a circumpolar species in arctic and subarctic waters. At least 15,800 to 18,450 individuals are estimated to summer in the coastal waters off Alaska and western Canada (Hazard, 1988). The reliability of abundance estimates varies greatly among the summering areas, and overall population trends are unclear. Bristol Bay is the only area in which surveys have been thorough enough to provide a baseline for evaluating population trends. Declines in abundance have been reported, although it is not known whether these represent a shift in the distribution or a decline in population size. Hunting appears to have the most clear and direct effects on the beluga population. The trend in the number of belugas harvested shows fewer whales being taken in recent years (Hazard, 1988). This should bode well for the overall population.

In waters off Alaska, belugas occur in the Cook Inlet/Gulf of Alaska area and in the Bering, Chukchi, and Beaufort Seas. Belugas in the Cook Inlet/Gulf of Alaska area appear to be year-round residents (Calkins, 1983) and do not appear to intermix with individuals from other populations (Sergeant and Brodie, 1969).

The major migratory group of beluga whales in Alaskan waters is the Bering Sea population. Individuals from this population winter over a broad area in the Bering Sea and summer in Bristol Bay, Norton Sound and the Yukon Delta, the Chukchi Sea including Kotzebue Sound

and waters in and adjacent to Kasegaluk Lagoon, and the eastern Beaufort Sea including the Mackenzie River Delta and Amundsen Gulf. The fidelity of individuals to summering areas and the degree of overlap in wintering areas is unknown. An estimated 1,000 to 1,500 belugas summer in Bristol Bay, 1,000 to 2,000 summer in Norton Sound and the Yukon River Delta, 2,000 to 3,000 summer in the Chukchi Sea, and 11,500 summer in the eastern Beaufort Sea.

After spending the summer months in coastal areas or associated with the offshore pack ice in the western Beaufort and northern Chukchi Seas, the belugas begin to migrate southward in the fall. Most belugas leave the southeast Beaufort Sea by mid-September (Davis and Evans, 1982). The peak migration out of the Beaufort Sea occurs before October, primarily well offshore. After entering the Chukchi Sea, belugas move southward as the pack ice advances. Most arrive in the vicinity of St. Lawrence Island in the northern Bering Sea in November and December. In March, April, and May as leads form and the pack ice melts, belugas move from the offshore Bering Sea wintering area toward coastal summering areas (Braham and Krogman, 1977; Seaman and Burns, 1981). Northward migrating belugas enter the Bering Strait during March through July. From the Bering Strait, belugas, bound for the eastern Beaufort Sea, follow leads along the northwest Alaska coast, round Point Barrow, and head east toward Banks Island, Canada, through a system of recurring leads far offshore (Fraker, Sergeant, and Hoek, 1978; Braham, Krogman, and Carrol, 1979). Spring migrants reach Banks Island in May and June.

As the ice retreats in June and July, belugas move in a second wave along the northwest coast of Alaska into Kotzebue Sound and the waters off Kasegaluk Lagoon. Belugas also arrive in inner Bristol Bay, Norton Sound, and the Yukon River Delta as the ice retreats (Hazard, 1988). The absence of sightings seems to indicate that few, if any, belugas remain in their wintering areas in offshore waters of the Bering Sea (Harrison and Hall, 1978; Leatherwood, Bowles, and Reeves, 1983).

Breeding appears to occur in the late winter and early spring. Calving occurs in all Alaskan coastal waters where belugas aggregate in summer. March through September constitutes the calving season with a peak in June and July, although some calving occurs prior to or during the spring migration (Hazard, 1988).

The diet of beluga whales is quite varied; over 100 kinds of organisms have been identified as prey items (Kleinenberg et al., 1964). Fish are the dominant food item in coastal areas of Alaska in summer (Lensink, 1961; Seaman, Lowry, and Frost, 1982); squid, octopus, and other invertebrates are also important at various times of the year.

#### b. Minke Whale

Minke whales (*Balaenoptera acutorostrata*) are widely distributed, occurring from the Bering and Chukchi Seas south to at least near the equator (Leatherwood et al., 1982). Population size in the Alaska/Pacific Regions is unknown (Department of Commerce (DOC), 1987). In the summer, minke whales appear to be broadly distributed between Baja California and the Chukchi Sea; in the winter, their range is more compressed, extending from Islas Revillagigedo, Mexico, into central California (Rice, 1974).

Although they have a wide distribution, minke whales are not considered abundant in any part of the North Pacific except Alaska. Little is known of their population size. Historically, these whales were not actively hunted due to their small size relative to other baleen whales. Current population numbers come from annual catches by Japanese and Korean whalers from the Okhotsk Sea-West Pacific stocks. (Minkes in the northeastern Pacific are protected from whaling.) Between 1954 and 1982, 22,746 minke whales were killed in the northwest Pacific. Based on this catch-per-unit effort and historical catches of minkes, the size of the west Pacific



stock was estimated in 1981 to contain 17,000 to 28,000 animals. The northeast Pacific population probably contains similar numbers.

These animals are present in Alaskan waters primarily during the summer. No reliable population estimates exist for these whales; however, they are considered common in the waters along the eastern Aleutians during that season.

Minke whales are relatively uncommon in central and northern California waters but have been sighted during all seasons; 71 percent of the sightings recorded in that area by Dohl et al. (1983) occurred from May through October. Overall, Dohl et al. (1983) reported that minke whales range along the outer edge of the continental shelf, and only rarely move inshore. Two of the four relatively low concentrations of minke whales observed by these investigators occurred within the northern California area, from San Francisco Bay to Point Arena, and from Cape Mendocino to Trinidad Head.

Repeated observations by other investigators of photo-identified individuals in northern Puget Sound suggest that some whales may reside there year-round. The seasonal variability of sightings of minke whales suggest that these animals are migratory like other baleen whales; however, no tagging data exist to support this hypothesis. Current belief is that the population as a whole shifts north in summer and south in winter, while some animals in temperate areas remain year-round.

Minke whales have been observed as individuals, pairs, or small groups along the California coast (Dohl et al., 1978), and occasionally congregate in larger groups in more northern latitudes with high food concentrations during spring and summer (Leatherwood et al., 1972). Minke whales breed in temperate or subtropical waters, and there is some evidence that calving occurs in southern California (Dohl et al., 1978). Parturition occurs in winter and spring.

#### c. Harbor Porpoise

Although harbor porpoises (*Phocoena phocoena*) are frequently observed in bays, harbors, and river mouths, they primarily inhabit open, unsheltered, nearshore waters from about Point Conception north to Alaska in the eastern North Pacific and are most abundant in waters from southern Alaska to Washington State (Leatherwood et al., 1982). From Cape Mendocino northward, they are one of the most common inshore cetaceans and are found almost exclusively within the 183-meter (100 fathom) curve, with most animals being in waters deeper than 18 m (10 fathom) (in most instances, within 0.3 miles of shore).

Only recently (Barlow, 1988) have there been comprehensive surveys of harbor porpoises on the Pacific Coast; therefore, no comparisons can be made regarding population changes.

The seasonal movements of harbor porpoises in the Alaskan/Pacific Regions are not well understood, but the porpoises are year-round residents of most areas. Any major seasonal shifts in distribution are believed to be as likely inshore-offshore as north-south.

This cetacean is fairly common along much of the Gulf of Alaska shoreline and the eastern Aleutians. Prince William Sound (off Valdez, Alaska) may have the highest concentration in winter than anywhere in the eastern Pacific. Harbor porpoises are rare in northern Alaska and are considered uncommon north of Bristol Bay.

Barlow (1988) estimates the population of harbor porpoises to be 46,000 in exposed coastal areas (but excluding several unexposed coastal bays) from Cape Flattery, Washington, to Point Conception, California. The California population is estimated at 10,000 individuals, of which about 82 percent are found north of Monterey Bay (DOC, 1987). Offshore surveys conducted statewide by Dohl et al. (1978, 1983) found this species to be most common in the Northern California Planning Area. Over the 3 years of the central and northern California



surveys, 66.5 percent of the recorded sightings occurred in nearshore waters north of Point Arena. Most sightings occurred less than 0.5 km from the shoreline, although occasional sightings occurred offshore in the Gulf of the Farallones (40 km from shore) and off Point St. George (70 km from shore).

Although most small cetaceans occur in associations with other species, the harbor porpoise is usually observed alone, in pairs, or in very small groups (Dohl et al., 1983). Newborns appear between May and July following a gestation period of 10 to 11 months (Dohl et al., 1983). Dohl et al. (1983) observed juveniles during most of the year, although with reduced frequency in the spring and early summer months.

Being inshore animals, harbor porpoises are particularly vulnerable to the impacts of human activities. Harbor porpoise mortality due to entanglement in gillnets has been documented in Monterey Bay and in the Gulf of the Farallones. From 1983 through 1985, an estimated 814 harbor porpoises were taken in gill and trammel nets in the area between Yankee Point in Monterey County and the Mendocino-Sonoma County line (California Department of Fish and Game, 1987). NMFS has initiated studies to determine the impact of set-net fisheries on population centers of harbor porpoises in California (Miller et al., 1982; DeMaster et al., 1985).

### 3. Pinnipeds

#### a. Northern Fur Seal

Northern fur seals are highly migratory and widely dispersed in pelagic waters of the North Pacific during the nonbreeding season (November to May or June), with various age- and sex-class segments of the population found from the southern Bering Sea south to California. Most adults spend the remainder of the year on the Pribilof Islands or foraging in the vicinity. This discussion summarizes and incorporates by reference the description of northern fur seals contained in the St. George Basin Sale 89 FEIS (DOI, MMS, 1985).

The northern fur seal population is estimated to be about 1.2 million (Fowler, 1985a). Of these, about 827,000 comprise the Pribilof Islands population (Zimmerman, pers. comm., 1987). About 4,000 are associated with San Miguel Island off Santa Barbara, California, and a small breeding group (1988: about 80 pups born) has established itself on Bogoslof Island, north of Umnak Island in the Aleutians. The remainder of the population breeds on islands off the coast of the U.S.S.R. Some mixing of North American and Russian stocks occurs (McAlister, 1981). From 1975 to 1981, the Pribilof population has declined at an estimated rate of about 4-8 percent per year (Fowler, 1982, 1985b). Since 1981, there has been no statistically significant trend (York and Kozloff, 1987). However, this species has been designated as depleted under the Marine Mammal Protection Act. Although the specific causes of population decline have not been determined, the most likely factors are increased mortality at sea, including entanglement in net fragments, and a suboptimal age- and sex-ratio in the population resulting in decreased productivity (Fowler, 1985a).

In general, chronology of the northern fur seals' return to the Pribilofs reflects the distance at which they winter from the islands. One large wintering concentration has been noted off Baranof Island in southeast Alaska, and individuals have been observed on Portlock Bank near Kodiak Island, and in the central Gulf of Alaska (Consiglieri and Braham, 1982). Northward migration of older females from California waters begins in March, and from April to mid-June, large numbers of males and females of all ages are found throughout coastal Gulf of Alaska and eastern Aleutian passes. Many females and young males follow a direct route across the gulf from the Pacific northwest to Kodiak Island and the eastern Aleutians (Bigg, 1982; Fiscus, 1978). Breeding-age males that have overwintered in the southern Bering Sea or western Gulf of Alaska return to the islands in late April and May, followed progressively by females and younger individuals from June through September or October. For the first 1 or 2 years, most

individuals remain at sea in coastal waters. Pups are nursed by the females for 3-4 months at 9- to 12-day intervals following their return from pelagic foraging trips. Females typically forage over the outer continental shelf and slope within 160 km of the islands, but also as far as 400 km away (Harry and Hartley, 1981). This range incorporates the eastern Aleutian passes and also extends northwestward along the shelfbreak to at least 175° W. longitude. Males abandon their territories by mid-August, hauling out elsewhere on the islands or returning to sea. Most northern fur seals begin their fall migration in late October and November, proceeding through the eastern Aleutian passes and following the edge of the continental shelf around the Gulf of Alaska and southward.

#### b. Steller Sea Lion

Steller (northern) sea lions occur over the continental shelf throughout the Bering Sea and Gulf of Alaska south to San Miguel Island in southern California (Burns, Frost and Lowry, 1985). This discussion summarizes and incorporates by reference the description of Steller sea lions contained in the St. George Basin Sale 89 FEIS (USDOI, MMS, 1985).

The total Steller sea lion population is estimated to be well under 100,000 and declining precipitously from the central Aleutian Islands to the Kenai Peninsula (Loughlin, 1989, per. comm.). Numbers in the western Aleutians, eastern Gulf of Alaska, southeast Alaska, Canada, Washington, and Oregon appear stable at present. The sea lion population in the eastern Aleutians exhibited a decline of about 50 percent between the late 1950's and the late 1970's (Braham et al., 1980), and has continued declining at a rate of 7 percent per year since then (Loughlin et al., 1986; Merrick et al., 1987), resulting in a decrease from about 50,000 to 10,000 individuals in this area. Although the possible causes of this decline have not been evaluated adequately, it is likely that factors contributing to decreased productivity are responsible since there is little evidence of increased emigration or mortality from this area (Lentfer, 1988). Though adequate information is lacking, factors potentially responsible for the decline include changes in the abundance of the size prey thought to be preferred by sea lions, and the presence in the Alaska population of two disease organisms that could cause reproductive failure and mortality (Merrick et al., 1987).

Sea lion rookeries in Alaska are located on the Pribilof Islands, on Amak Island north of the Alaska Peninsula, throughout the Aleutian Islands and western Gulf of Alaska to Prince William Sound, and on Forrester Island in southeast Alaska. Nearly half of the world sea lion pup production is estimated to occur at four rookeries in the western Gulf of Alaska. Haulouts are numerous throughout the breeding range and some are used in the northern Bering Sea as well. Males and subadults of both sexes haul out at many locations not used as rookeries, and many rookeries are occupied year-round. Mature males begin arriving at the rookeries in early May, preceding the arrival of females. Pupping lasts from mid-May until mid-July. Nursing females alternate periods on land of 1-3 days with foraging bouts at sea averaging less than 24 hours (Gentry, 1970).

Sea lions are not noted for undertaking migrations comparable to that of the fur seal, but there are definite dispersals throughout their range following the breeding season including a regular late summer-early fall movement of 1000 or more males to St. Lawrence Island and the Bering Strait, and movement of males from California north to haulouts in Oregon, Washington, Canada or southeast Alaska (Burns et al., 1985). Movement of sea lions in the Gulf of Alaska, especially juveniles, has been documented extensively. These include movements between the Barren Islands, Chirikof Island, islands along the Kenai Peninsula, Prince William Sound, southeast Alaska and British Columbia. Movement of males from the Aleutian Islands to the ice front in the central Bering Sea apparently occurs in winter and spring (Lowry et al., 1982).



#### c. Guadalupe Fur Seal

The Guadalupe fur seal (*Arctocephalus townsendi*) was listed as threatened in 1985 by NMFS. These animals are known to breed only on Guadalupe Island offshore central Baja California, Mexico. The breeding season extends from May to late July. In 1984, 1597 animals were counted on the Island (Seagars, 1984). This count is still considered the most reliable count of this species.

In the Pacific Region a few non-breeding individuals have been seen on San Miguel Island each year since 1969 during the breeding season (Seagars, 1984). The number of seals seen on the island has ranged from one to a maximum of five animals in 1978. The species has also been seen at San Nicolas, San Clemente, and Santa Barbara Islands (Stewart et al., 1985). In 1984, a female was stranded at Pillar Point, San Mateo County; and in 1988, a female was stranded near Jenner, California, in Sonoma County.

No studies of the movements or migration have been conducted, but these seals are believed to spend at least part of their lives living pelagically.

#### d. California Sea Lion

The world population of the California sea lion (*Zalophus californianus*) (not including the population in the Galapagos) is estimated to be over 157,000 animals (DOC, 1987). They presently range from British Columbia (Bigg, 1973) to Acapulco, Mexico (Gallo-R. and Ortega-O., 1986).

Total population growth estimates, based on pup production records, are reported to be about 7 percent, representing a potential doubling of the population every ten years (Bonnell et al., 1983). As a result of increased numbers, animals are also expanding their range. Sea lions are becoming common offshore the Pacific Northwest where they were almost unheard of before the 1970's. Recently observed increases in this species abundance within the Pacific Region are thought to be attributed to the increase of the southern California breeding population.

In the Pacific Region, the California sea lion is the most abundant pinniped on land and in waters over the continental shelf (<200 m) except in winter and spring when their numbers are surpassed by migrating northern fur seals. It breeds in the summer on islands from the Gulf of California in Mexico to the Channel Islands in southern California. Although a few pups have been born on Ano Nuevo Island (Keith et al., 1984) and Southeast Farallon Island (Pierotti et al., 1977) in recent years, viable rookeries have yet to be established north of Point Conception. Bonnell et al. (1983) observed highest densities of California sea lions in northern California waters in the fall. Most of the sea lions sighted during all seasons (57 percent) were over the shelf.

In northern California, Oregon, and Washington, California sea lions generally reach maximum abundance in the fall (September and October), when thousands of sea lions (mainly immature and adult males) disperse (some adults move as far north as British Columbia) northward from the Channel Island rookeries; a second, lower peak in abundance may occur in the spring, when animals return southward toward the rookeries. Populations in Oregon and Washington have been estimated at 6000 individuals during fall and winter. Along the California coastline north of Point Reyes, the numbers of California sea lions observed on land have varied from a few hundred in mid-summer to more than 5,500 in the fall, with 2,000-2,500 generally present through the winter and spring (Bonnell et al., 1983).

#### e. Ice Seals

Four seal species in Alaska (spotted, ribbon, bearded, ringed) are ice associated for much or all of the year. For all of these species, ice provides a substrate for resting and other activities, including reproduction, being near their food supply, and their distribution and abundance,



which is tied closely to the extent, physical characteristics, and timing of formation or disintegration of sea ice (Burns et al., 1980, 1981).

Spotted seals (200,000 to 250,000) are estimated to inhabit the Bering/Chukchi Sea region (Lowry et al., 1982); about 70,000 of these occur in Alaskan waters. According to Burns et al., (1980), winter/spring densities are greatest east of the Pribilof Islands ( $2.0 \text{ seals/km}^2$ ). Spotted seals occur in the central Bering Sea ice front from January through late April or early May (Burns et al., 1980). Their major winter/spring range extends from Bristol Bay west and northwest across the central Bering Sea (Frost et al., 1982; Lowry et al., 1982). Pupping occurs on the ice from late March to late April, especially in the Bristol Bay/Pribilof Islands area. After pupping and mating, spotted seals may occur in loose groups of 200+ individuals, especially in large areas north and south of St. Lawrence Island, before moving generally northward to occupy coastal areas from Bristol Bay to northern Alaska as the ice disintegrates and recedes (Burns et al., 1985). As many as two to three thousand seals may occupy several of the summer haulouts scattered along this coastline.

The current estimate of the Bering Sea ribbon seal population is 100,000 to 110,000 seals (Burns et al., 1985). From February to mid-May they are distributed throughout the ice front, and are most numerous west of the Pribilof Islands (Burns et al., 1980; Frost et al., 1982). Their highest density ( $0.3/\text{km}^2$ ) has been recorded west of St. Matthew Island (Brueggeman and Grotefendt, 1986). As the pack ice disintegrates in spring, ribbon seals are concentrated on ice remnants where they molt. They apparently become pelagic during summer and autumn occupying both Bering and Chukchi Seas (Lowry et al., 1982). Most summer sightings occur in the vicinity of the Pribilof Islands (Burns et al., 1985). Burns (1981a) speculated that they feed along the shelf break during this period.

An estimated 300,000 bearded seals occupy the Bering/Chukchi Sea region (Braham et al., 1977; Burns, 1981b). They migrate considerable distances in spring and fall, following the seasonal ice movements. During winter and spring, they are widely distributed in the drifting ice of the central and northern Bering Sea and in the southern and eastern Chukchi Sea where openings in the ice are frequent. Densities are greatest ( $0.3\text{-}0.6 \text{ animals/km}^2$ ) south of St. Lawrence Island and west of St. Matthew Island (Lowry et al., 1982; Burns et al., 1985). Pupping takes place on the ice from late March to mid-May. The majority of bearded seals spend the summer near the edge of multi-year ice in the northern Chukchi Sea.

Ringed seal population estimates derived from observed densities ( $0.1\text{-}1.8 \text{ animals/km}^2$  on Chukchi and Beaufort Sea shorefast ice;  $0.03\text{-}0.06/\text{km}^2$  in pack ice) and estimates of available habitat yield conservative values of 250,000 individuals in shorefast ice, and a 1 to 1.5 million total Alaskan population (Burns, 1981c; Burns et al., 1985). During winter (January-March), ringed seals are abundant in coastal fast ice areas in the Chukchi and northern Bering Seas; less so south of St. Lawrence Island, except in stable land fast ice. They range as far south as Bristol Bay. During March and April most ringed seals establish their territories on landfast ice. Most individuals move north with the receding pack ice in April (Lowry et al., 1982); relatively high densities occur in late spring between St. Lawrence Island and Bering Strait. Aggregations of a few hundred individuals may occur.

#### f. Pacific Walrus

In Alaska, the Pacific walrus ranges from the southeastern Bering Sea to the Beaufort Sea. A large proportion of the estimated (1980) 270,000 to 290,000 walrus migrate north and south with the seasonal pack ice (Krogman et al., 1979; Fay, 1982; Burns et al., 1985; Fay et al., 1986). Most spend the winter in the Bering Sea, while over 100,000 summer in the Chukchi Sea (Sease and Carpenter, 1988). Herds of migrant walrus move south into the Bering Sea from October through December. During the winter months (January-March) walrus may be found

wherever openings are numerous in the drifting pack ice; most animals occur in the relatively thin ice west and as much as 300 kilometers southwest of St. Lawrence Island and in the Bristol Bay area. Smaller concentrations occur east of the Pribilof Islands and southwest of Cape Navarin. Mating occurs during this period, primarily in the St. Lawrence Island and Bristol Bay areas (Fay et al., 1984a).

Beginning in April, nearly all pregnant females and those with young move north with the receding pack ice leaving behind substantial numbers of adult and subadult males (Fay, 1982). Spring densities of 4.5/km<sup>2</sup> have been recorded in the vicinity of St. Matthew Island and westward (Brueggeman and Grotefendt, 1986). Most calves are born during the northward migration. By late June the migrants have passed through the Bering Strait to occupy two large arctic areas (from the Bering Strait west to Wrangel Island, and the northeastern Chukchi Sea). Adult and subadult males that remain in the Bering Sea in summer most consistently haul out at several sites in northern Bristol Bay and on St. Matthew and Hall Islands. Significant numbers may summer between St. Lawrence Island and the Bering Strait (Fay et al., 1984b).

Recent trends in several population parameters that have preceded declines in other wildlife populations suggest that the Pacific walrus population may experience a downward trend in the foreseeable future (Burns et al., 1985). Walrus are bottom feeders, feeding mainly on clams at depths of 80 meters or less (Fay, 1982; Fay et al., 1984b).

#### g. Other Pinnipeds

##### (1) Northern Elephant Seal

Prior to the commercial harvesting of the 1800's, the range of the northern elephant seal (*Mirounga angustirostris*) extended from Point Reyes, California, (just north of San Francisco) to Cabo San Lazaro, Mexico. The species was thought to be extinct until 1892, when a small population of no more than 100 animals was discovered on Isla de Guadalupe, off Baja California. The present breeding range of the northern elephant seal extends from Isla Natividad in Baja California to Point Reyes in northern California (Bonnell et al., 1983; Allen et al., in press). (The largest rookeries are, in descending order, Isla de Guadalupe, San Miguel Island, Isla San Benito, Ano Nuevo Island, and San Nicolas Island.) Population size is estimated at 100,000 (DOC, 1987). Cooper and Stewart (1983) estimates that the population has been doubling every 5 years since the early 1960's.

Northern elephant seals are present in the Pacific Region year-round. They spend most of their time well offshore, feeding at depths of 350 to 650 meters (.2 to .4 miles), with only 14 percent of their time being spent on the surface (Le Boeuf et al., 1987). They return to the rookeries to breed in late December to early March. Females give birth about a week after they arrive. They nurse pups until they are about 1 month old. While on the rookeries, animals abstain from food and water until after the breeding season. (In spring, females and juveniles return to molt; males return in the summer.)

Over 90 percent of the breeding population occurs south of Point Conception. Isla de Guadalupe and San Miguel Island produce some 7000 and 4000 pups/year, respectively, which make up about 75 percent of the year's production (LeBoeuf 1977).

The most northern rookeries occur at Ano Nuevo Island, Point Reyes (the species' largest rookery north of the Channel Islands), Southeast Farallon Island, and Point Reyes. In 1986, approximately 2,200 pups were born on these three or four rookeries (Pierson and Le Boeuf, 1987; Huber et al., in press). Point Reyes, where 19 pups were born in 1986, is now the northernmost established elephant seal rookery. Few elephant seals are sighted on land north of Point Reyes.



No specific patterns of migration have been documented; however, tagged animals are known to disperse from rookeries to the north, some as far north as the Gulf of Alaska.

## (2) Harbor Seal

Along the west coast of North America, the range of the harbor seal (*Phoca vitulina*) extends from Alaska south to Baja California. The harbor seal is a year-round resident of the Alaskan/Pacific Region Coasts, hauling out on islands, estuaries, secluded beaches, and offshore rocks along the length of the coastline (Bonnell et al., 1983; Hanan et al., 1987). The most recent estimate of the population size is 320,000 animals, of which 42,000 (14 percent) are south of Alaska (DOC, 1987).

In coastal Alaska, harbor seals are found from Kuskokwim Bay through southeast Alaska. They are generally considered sedentary, and long-range movements are uncommon. Seals in Kuskokwim and Nanvak bays, however, do move south of the ice pack to the Alaskan Peninsula to winter, and some disperse following the breeding season and have been known to move some 550 km (340 mi) (Hoover, 1988).

Based on censuses performed from 1982-1986, the harbor seal population in California appears to be stable. The NMFS estimates that the population in Oregon has increased by 7 percent annually since 1977 and about 10 percent annually in Washington since 1976 (DOC, 1987).

The picture in Alaska is less clear, however. Hoover (1988) presents a discussion on the problems of obtaining quantitative data on seals in Alaska and summarizes information on the population trends. In summary, it appears that the populations along the northern Alaskan Peninsula and on Tugidak Island are declining. However, the population in the Gulf of Alaska is believed to be increasing. Populations elsewhere are presumed to be stable.

Peak harbor seal populations on land occur during the species' spring breeding and pupping season and early summer molt. In many haul-outs in the Pacific Northwest, peak haul-out abundance occurs in the early spring and late summer. These peaks seem to be correlated more with maximum prey abundance (herring, anchovies, and chinook salmon) as well as the time of the summer molt (Bayer 1985; Brown and Mate 1983; Graybill 1981).

Following the breeding and pupping season, harbor seals disperse along the coast and spend more time at sea throughout the fall and winter.

Harbor seals forage close to shore and are seldom seen in waters deeper than 200 m (Bonnell et al., 1983). Although a few animals were seen as far as 46 km from land (Bonnell et al., 1983), most (91 percent) were sighted within 20 km of the coastline.

## 4. Polar Bear

Polar bears are most abundant around the perimeter of the polar basin in association with drifting pack ice or shorefast ice where seals are common. Although they have been recorded as far south as St. Matthew, Nunivak, and the Pribilof Islands in the Bering Sea, they regularly occur only as far south as the Bering Strait and St. Lawrence Island (Lentfer, 1972). Available information suggests Alaska has two relatively discrete polar bear populations: one in the Beaufort Sea and one in the Chukchi Sea, with the boundary between Pt. Lay and Pt. Barrow. However, there is relatively little interchange of individuals between the two groups. Those in the Chukchi Sea make extensive north-south migrations in relation to the pack ice edge (Amstrup and DeMaster, 1988). Bears are most abundant along the Alaskan coast in years when winds drive old ice near shore. As the ice edge recedes northward in spring and early summer, the bears move north with it. Mature males are generally found further north than subadults and females with cubs which occupy drifting ice and the floe edge. Females with cubs also may occupy shorefast ice, although this appears more characteristic of those in the

Canadian Beaufort. As ice forms in the fall, bears from the drifting ice move generally southward and become distributed along the coast by late fall. Bears have been observed at much higher densities in favorable foraging habitat such as where new ice has formed and along leads than is observed generally in the pack ice (Gardner, 1989, per. comm.).

Low polar bear densities preclude accurate estimates of population size at the present level of survey effort; currently, the most accepted estimate for the total Alaskan population is 3,000-5,000 individuals with perhaps 2,000 occurring in the Beaufort Sea (Amstrup et al., 1986). Probably as a result of restricted hunting, polar bear populations are thought to be similar to those of the 1950's and may be increasing in some areas.

Females enter maternity dens excavated in snow by late November and usually emerge, with cubs born in December or January, by late March or early April. Females are very sensitive to disturbance during this period (Lentfer and Hensel, 1980; Amstrup, 1986). Most dens are located on land near the coast or on offshore islands, on shorefast ice, or, to a lesser extent, on drifting pack ice. Wrangel Island is an important denning area in the Chukchi Sea area.

### **C. Marine and Coastal Birds**

#### **1. Threatened or Endangered Birds**

##### **a. Arctic and American Peregrine Falcons**

Based on 1988 surveys, the population of arctic peregrine falcons now stands at about 80 pairs and 120 young. The population of American peregrine falcons in Alaska is estimated at about 225 pairs (DOI, Fish Wildlife Service (FWS), 1989; Ambrose, pers. comm., 1989) while in California 64 pairs are estimated (DOI, FWS, 1986). The FWS estimates that 200 pairs of arctic and 400 pairs of American peregrine falcons historically nested in Alaska. Beginning in the late 1940's, the use of the organochlorine pesticides greatly affected peregrine falcons, causing birds to lay thin-shelled eggs which often failed to hatch, and consequently lowered reproduction. In Alaska, the population of arctic peregrine falcons declined to approximately 30 percent of historical levels. In 1978, a number of years after the United States had restricted the use of organochlorine pesticides, the peregrine falcon population began to increase, and the trend has continued to that present.

Endangered American peregrine falcons nest on cliffs in interior Alaska, south of the Seward Peninsula and Brooks Range. Threatened arctic peregrine falcons nest in the tundra regions of Alaska, north of the Brooks Range and on the Seward Peninsula. Arctic peregrine falcon nest sites have been found on cliffs, bluffs, and low hills (DOI, FWS, Region 7, 1982). Peregrine falcon nest sites closest to the coast occur on shoreline cliffs adjacent to Norton Sound. On the North Slope, nesting sites nearest the coast occur about 25 miles inland (DOI, MMS, 1984).

Peregrine falcons are usually present in Alaska from about mid-April to mid-September. Egg laying occurs about the third week of May for interior Alaska, and the first week of June for the North Slope. The young fledge about the end of July in the interior, and about mid-August on the North Slope (DOI, FWS, Region 7, 1982). Immature arctic peregrines are known to use northern Alaskan coastal habitats east of the Colville River on a transient basis from mid-August to mid-September (DOI, MMS, 1984).

Data regarding the migration routes of Alaskan peregrine falcons are limited; however, it appears that falcons from the North Slope and eastern interior generally follow the central flyway, and falcons from the western interior follow the Pacific flyway. Migrating peregrine falcons have been seen in the Malaspina Glacier area adjacent to the Gulf of Alaska, but arctic and American peregrines probably occur in the Gulf of Alaska/Cook Inlet area only irregularly during migration (DOI, FWS, Region 7, 1982). Peregrines which occur along the California



coast are probably year-round residents, although some winter movements may occur. The mouths of most major rivers and estuaries in northern California are important foraging areas (DOI, FWS, 1982).

Arctic and American peregrine falcons winter in Latin America from September to April, as far south as 40° S. latitude in Chile and 38° S. latitude in Argentina (Steullet and Deautier, 1935; cited by DOI, FWS, E1982). Wintering habitats apparently vary widely from sea level to an elevation of 10,000 feet, but all wintering areas likely include undisturbed roosting areas and an adequate avian prey base (DOI, FWS, Region 7, 1982).

Peregrine falcons feed mostly on other birds. Prey remains at coastal nest sites in Alaska indicated that shorebirds, gulls, seabirds, waterfowl, and various small land birds were taken by peregrines (Wright, 1987). Similar species were taken by peregrine falcons migrating through central Alberta, Canada (Dekker, 1980). Shorebirds, gulls, and waterfowl appear to be important food sources in a number of wintering locations (DOI, FWS, Region 7, 1982).

#### b. Short-Tailed Albatross

The short-tailed albatross were once abundant and widespread in the North Pacific, including coastal areas from Alaska to Baja California where upwellings brought nutrient-rich waters to the surface. Activities of feather hunters on the nesting grounds reduced the species to near extinction (Hasegawa and DeGange, 1982). Since their rediscovery as a breeding species on Torishima Island (580 km south of Tokyo, Japan) in the early 1950's, the short-tailed albatross have staged a slow comeback and now number approximately 400 individuals (H. Hasegawa, pers. comm., 1988). Protection and habitat improvement on the breeding grounds have resulted in the increased population and would appear to offer promise for a continued rise in the population.

From observations and band recoveries during the last 20 years, it appears that the short-tailed albatross still occur over much of their original range but in greatly reduced numbers. Birds begin arriving at the breeding island, Torishima, in early October. Failed breeders and nonbreeders depart Torishima in winter and spring with successful breeders and fledglings departing from late May to June. Individuals probably scatter widely over the North Pacific but may concentrate in nutrient-rich waters (Hasegawa and DeGange, 1982).

Short-tailed albatrosses are surface feeders and often feed nocturnally on squid, which come to the surface primarily at night (Hasegawa and DeGange, 1982).

#### c. California Least Tern

Least terns (*Sterna antillarum*) migrate from Mexico each spring to establish small breeding colonies on the coast from northern Baja California to San Francisco Bay. At one time their nesting habitats formed a discontinuous band along the coast, primarily on sand ocean beaches. However, increased human activity there has made these areas largely uninhabitable so that breeding now occurs on some 20 isolated coastal areas: the majority being in southern California on military bases (Seal Beach Weapons Station and Camp Pendleton). The FWS estimated that between 1984 and 1987 there were approximately 940, 1020, 960, and 940 breeding pairs in California. (Population estimates for 1974 to 1977 were approximately 580, 600, 660, and 770 breeding pairs.)

Nesting locations are on open expanses of sand, dirt, or dried mud close to a lagoon or estuary where small fish can be obtained. Eggs are laid in mid-May to early August (FWS 1980a).

By late September, the California least terns migrate south. The migration route and winter distribution of these birds are almost unknown, as they tend to blend in with other wintering

terns. (The racial differences between small terns which winter in Mexico are evident only when birds are in breeding plumage.)

#### d. California Brown Pelican

This species (*Pelecanus occidentalis*) breeds from the Channel Islands Marine Sanctuary (Anacapa and Santa Barbara Islands) to islands in the Gulf of California (Baja California), and on the Tres Marias Islands off Nayarit (FWS, 1980b). Listing of the California brown pelican was based primarily on serious declines observed in the southern California Bight population of this subspecies. The history of the California brown pelican's decline, due to the bioaccumulation of chlorinated hydrocarbons (DDT, DDE, dieldrin, and endrin) in the food chain and scarcity of food (i.e., anchovies), is well documented in the literature (Schreiber and DeLong, 1969; Jehl, 1973; Gress, 1970; Risebrough et al., 1971; Anderson 1977; Keith et al., 1971; Anderson et al., 1975; and Anderson and Gress, 1983) and is summarized in the Brown Pelican Recovery Plan (DOI, FWS, 1982).

Pelicans are now successfully breeding on both Anacapa and Santa Barbara Islands in the Channel Islands Marine Sanctuary. The Coronados colonies have not been successful during the past few breeding seasons (Harlow, DOI, FWS, pers. comm. 1987).

Preferred nesting habitats of the California brown pelican are on offshore islands, although some individuals nest in mangroves along the Mexican coast. In 1986, the southern California Bight breeding population was estimated at 7,400 pairs (Harlow, DOI, FWS, pers. comm. 1987).

After the major breeding season (January-April), birds disperse along the California, Oregon, and Washington Coast. Large numbers of pelicans begin appearing north of the breeding colonies by July, staying through September.

Briggs et al. (1983) observed approximately 24,000 post-breeding birds ashore and at sea in north and central California in July of 1980 and 1982, and 33,000 in 1981. The Gulf of Farallons is particularly important to post-breeding pelicans. During this time, approximately 50 percent of the population may occur on the coastal waters between Bodega Bay, Marin County, and Monterey Bay (Anderson, pers. comm. 1987). Up to 6,000 pelicans may use the Farallon Islands to roost during the summer.

Briggs et al. (1987b) estimated that 70-80 percent of the maximum Statewide pelican population occurred south of Point Conception during September or October. Briggs estimated the total pelican population to be as high as 80,000-110,000.

There have been no systematic surveys of the post-breeding pelican population of Oregon and Washington. Post-breeding birds have distinct requirements for daytime versus nighttime roost. Night roosts are usually in regions with high oceanic productivity and are isolated from predation pressure and human disturbance. Requirements for daytime roost are less restrictive, and therefore, birds are found in more varied locations (Jacques and Anderson, 1987).

Since brown pelicans feed by plunge-diving from 15 to 20 meters above the surface, their feeding activities are limited by turbidity of the water below. The major food item of these birds is small schooling fish (primarily anchovies) (DOI, FWS, 1982).

#### e. Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) is listed as "Endangered" in California and "Threatened" in Washington and Oregon (50 CFR 17.11 & 17.12). The bald eagle is unlisted in Alaska.



The following discussion of bald eagles is based largely on Gerrard (1983), Green (1985), Grubb et al. (1983), Keister and Anthony (1983), Keister et al. (1987), King et al. (1972), Millsap (1986), Stalmaster (1987) and BLM (1989) pers. comm.

Historically, the bald eagle was widespread throughout North America. On the Pacific Coast the historic range was from south of the arctic tundra in Alaska to Baja, California.

The status of bald eagles has been an item of concern since, at least, the early part of the century. Between 1900 and 1940, there were several noticeable population declines due primarily to habitat loss and shooting. The concern over the possible extinction of the national symbol prompted Congress to pass the Bald Eagle Protection Act in 1940. This law prohibited the shooting of eagles or the possession of any parts of an eagle. The decline in eagle numbers continued into the mid-1970's due primarily to the extensive use of DDT from 1947 until its banning in 1972. (For further discussion and references of the impacts and bioaccumulation of DDT on fish-eating birds of prey, see the discussion on brown pelicans - Section III.C.1.d.)

Although the bald eagle still faces many problems, most experts agree that the productivity of eagles has increased in recent years. Prior to the widespread use of DDT, nationwide nesting productivity was estimated at some 1.6 birds/nest. Before DDT was banned, productivity had fallen as low as .2 birds/nest in many areas. Currently, nationwide nesting productivity is believed to be some 1 to 1.1 birds/nest. While this is an encouraging sign, the survival rate of eagles is still unusually low. Fifty to 70 percent of fledglings die within 1 year and more than 90 percent die before reaching sexual maturity at age 4. Therefore, population growth and/or stability in many areas will not likely be achieved until both reproduction and survival rates improve.

Historically, Canada and Alaska produced the bulk of the eagles in North America. This is still true today as almost 70 percent of the 70,000 eagles believed to be in North America are found in Alaska and British Columbia. The number of breeding pairs and wintering eagles, respectively (which includes juveniles and sub-adults) in the Alaska Region are estimated as follows: Alaska (7000-8000 and 40,000); British Columbia (4500, and 28,500). The number of breeding pairs in the Pacific Region are Washington (309); Oregon (166); and California (83).

The breeding season is from January to early March in northern California and Oregon, from February through March in Washington, and from late March through May in Alaska.

Almost 100 percent of eagle nests are found within 2 miles (and the vast majority within a half mile) of a coastal area, river, lake or bay. Birds build nests typically in the largest trees in the timber stand that offers them an unobstructed flight path to water.

The age at first breeding is generally 4-5 years. A female lays a single clutch of 1-3 eggs, though not necessarily every year. Eggs hatch about 34-36 days after laid. Young fledge from 70-98 days after hatching. Fledglings remain dependent on adults for another 60-80 days until they learn to successfully hunt alone.

Bald eagles are considered opportunistic feeders. Although their diet is known to consist of almost anything of food value, they are known to clearly prefer fish - dead or alive. The second most preferred food item is birds (mostly seabirds) followed by mammals. Eagles prefer to scavenge or steal food items from other predators (especially ospreys) rather than hunt. But when these birds do hunt, they do so primarily by snatching fish from just below the water surface with their talons while in flight or ambushing waterfowl from a perch.

The lack of available prey appears to be the driving force behind the winter migration. This is especially true of birds from central Alaska and Canada. When rivers and lakes freeze over and waterfowl migrate south, the local eagle populations tend to migrate to warmer climates. In

these breeding areas where fishing areas do not freeze over, the local eagle population is typically sedentary and often augmented with migrants from the north or the interior regions. (For example, the birds wintering on the coast of southeast Alaska and Oregon and Washington mostly come from the interior of Alaska and British Columbia.)

Large numbers of birds are known to concentrate in the wintering areas. Thirty to one hundred birds are not uncommon in favorite areas where sufficient food is available. Certain productive areas can even support hundreds or even thousands of birds during the winter. However, the most common situation is an aggregation of only a handful of birds. During the evening, birds from surrounding areas typically concentrate at a communal roost that usually numbers 20-40 birds.

The fall migration, which began in October, generally peaks in January. By the end of March most birds have already migrated north.

The following list is of the more important breeding and/or roosting areas of bald eagles in the Alaska/Pacific Region:

Chilkat River Valley (near Haines, Alaska) - has the largest concentration of bald eagles in the world with over 3000 during the autumn; Admiralty Island (near Juneau, Alaska) - has dense concentrations of nesting eagles; Queen Charlotte Island and Vancouver Islands Archipelago - has thousands of breeding and wintering eagles throughout the year; Skagit River Canyon and San Juan Islands (in northwest Washington) - has hundreds of nesting and wintering eagles; Olympic National Park - has several breeding and wintering eagles year round; and Klamath Basin (the area of Klamath Falls, Oregon and the Lower Klamath and Tule Lakes of California) - has large breeding and wintering populations.

## **2. Nonendangered Birds**

### **a. Geese**

Ten species or subspecies of geese (excluding the endangered Aleutian Canada) breed and/or migrate in the Alaska region (Bellrose, 1980). These include the white-fronted, tule, lesser snow, emperor, dusky Canada, Vancouver Canada, lesser Canada, cackling Canada, Taverner's Canada, and Pacific black brant. Most nest in coastal Alaska and Canada and migrate to wintering areas in the western United States and Mexico. Migration corridors include inland, coastal, and offshore routes. Major nesting concentrations occur on the Yukon-Kuskokwim (Y-K) Delta and the arctic slope. Certain areas on the arctic slope, lagoons and bays of the Beaufort, Chukchi and Bering Seas and Y-K Delta, the north side of the Alaska Peninsula, and several areas in the Gulf of Alaska are important molting and/or staging areas prior to migration.

Until recently, populations of four geese (white-fronted, emperor, cackling Canada, and black brant) that breed principally on the Y-K Delta had declined more or less steadily from high levels recorded in the mid-1960's. The Yukon-Kuskokwim Delta Goose Management Plan may account for the more favorable recent trends in these populations, by having provisions that seek to eliminate egg gathering, curtail hunting during the nesting through molting periods, and prohibit hunting of any of the four species noted above when their populations fall below a management threshold. However, since the implementation of a management plan with strict regulation of subsistence and sport harvests, these populations appear to be stabilizing or even increasing somewhat (FWS, pers. comm., 1989.)

#### **(1) White-fronted Goose**

From a high point of about 500,000 in the mid-1960's, the Pacific flyway white-fronted goose population declined to about 90,000-100,000 by 1976 where it remained until 1986 (FWS,



per. comm., 1989). The population has increased over the past 2 years, and is presently estimated at 161,500. Probable factors responsible for the decline include excessive harvest of birds and their eggs on the breeding grounds, excessive harvest in migration and wintering areas, and declining availability of suitable winter habitat (i.e., only 4 percent of the original wetlands of California's Central Valley remain, and certain agricultural land uses reduce suitable habitat still further and may result in increased disease mortality). Adverse weather conditions that delay nesting also can have a major effect, and an increasing level of disturbance on the Y-K delta has a similar long-term potential.

About 95 percent of the whitefronts that winter in the Pacific region nest on the Y-K Delta, occupying a variety of tidal to upland habitats as dispersed pairs from May to August. Most of the remainder nest in the Innoko River Valley and Bristol Bay lowlands, with small numbers nesting in the interior and on the arctic slope. Beginning in August, most delta whitefronts migrate directly across the North Pacific to staging areas in the Klamath Basin in Oregon and northern California. A small proportion follow a coastal route with stops in northern Bristol Bay, Upper Cook Inlet, Copper River Delta, and several other areas in southeast Alaska, British Columbia, Washington, and Oregon; a few of these follow a route inland of the coastal mountains. Most eventually move to wintering areas in California's Central Valley in late October. Small concentrations overwinter in central highland and West Coast areas of Mexico, and about 10 percent of the population has occupied the Klamath Basin in recent winters. Spring migration in April and May essentially retraces the coastal and inland portions of the fall route.

## (2) Emperor Goose

From a high point of about 139,000 in the mid-1960's, the emperor goose population declined to about 42,000 by 1986 (DOI, FWS, pers. comm., 1989). The population has increased slightly over the past 2 years, and is presently estimated at 53,800. Probable reasons for the decline include excessive harvest of birds and their eggs on the breeding grounds and excessive harvest in migration and wintering areas. Adverse weather conditions that delay nesting also can have a major effect, and an increasing level of disturbance on the delta and Alaska Peninsula has a similar long-term potential. The Yukon-Kuskokwim Delta Goose Management Plan may account for the more favorable recent trends in these populations, by having provisions that seek to eliminate egg gathering, curtail hunting during the nesting through molting periods, and prohibit hunting of any of the four species noted above when their populations fall below a management threshold.

Virtually the entire emperor goose population is restricted to the Bering Sea region. An estimated 80-90 percent of Alaskan emperors breed on the Y-K Delta, nesting in loose colonies in tidal grassland, lowland tundra, and marsh habitats within several hundred yards of tidewater (although this may extend 30-40 miles inland along tidal streams). Small numbers nest adjacent to other Alaska OCS planning areas on Nunivak Island, near Shishmaref on the Seward Peninsula, and near Kivalina north of Kotzebue. In the U.S.S.R., emperors nest along the coast of the Gulf of Anadyr and Chukotsk Peninsula. Nesting begins in late May and early June. Substantial numbers of subadult emperors and failed breeders from the Y-K Delta and U.S.S.R migrate to St. Lawrence Island in mid-June to molt; apparently, few nest on the island. Most emperors migrate from the delta across Bristol Bay to lagoons on the north side of the Alaska Peninsula in late August and September, most arriving by early October. From there they spread throughout the Aleutian Islands in November and December. A small percentage migrate from the Y-K delta to winter on Kodiak Island. Emperor geese begin moving eastward along the Aleutians in March, congregating prior to breakup along the north side of the Alaska Peninsula in April, arriving on the Y-K delta in May. Spring migration to Soviet breeding areas proceeds along the Alaska coast and through the Bering Strait.

### (3) Cackling Canada Goose

From a high point of about 384,000 in the mid-1960's, the Pacific flyway cackling Canada goose population declined to about 19,000 by 1985 (DOI, FWS, pers. comm., 1989). The population has increased over the past several years, and is presently estimated at 69,900. Probable factors responsible for the decline include excessive harvest of birds and their eggs on the breeding grounds, excessive harvest in migration and wintering areas, and declining availability of suitable winter habitat (i.e., only 4% of the original wetlands of California's Central Valley remain, and certain agricultural land uses reduce suitable habitat still further). Adverse weather conditions that delay nesting also can have a major effect, and an increasing level of disturbance on the delta and Alaska Peninsula has a similar long-term potential. Breeding cacklers arrive on the Y-K Delta coastal fringe in early May. Nesting begins in late May in vegetated intertidal areas and wet tundra meadows. In August, most of the population migrate south along the coast to Ugashik Bay and Cinder River on north side of the Alaska Peninsula where they feed on intertidal meadows until October. Small numbers of cacklers also molt and stage on Nunivak Island during the fall. From the peninsula, most proceed in October on a direct flight to the Willamette Valley in Oregon and the Klamath Basin in northern California where they rest and feed until late November, at which time the majority proceed to the wintering area in the Central Valley of California. Greatest overwintering concentrations occur in the Sacramento Valley, the San Joaquin Valley, and the San Francisco Bay area. A small percentage winter in Oregon. For most of the population, the spring migration route in late April and early May includes stops in southeast Alaska, Copper/Bering River Deltas, Prince William Sound, and several areas in Upper Cook Inlet (Redoubt Bay, Trading Bay, and Susitna Flats) before proceeding overland to the Y-K Delta.

### (4) Pacific Black Brant

From a high point of about 187,000 in the mid-1960's, the Pacific black brant population declined to about 109,000 by 1983 (DOI, FWS, pers. comm., 1989). The population has increased over the past several years, and is presently estimated at 138,600. Probable factors responsible for the decline include excessive harvest of birds and their eggs on the breeding grounds, excessive harvest in migration and wintering areas, declining availability of suitable winter habitat, and elevated effects of predation on the reduced population. Adverse weather conditions that delay nesting also can have a major effect, and an increasing level of disturbance on the Y-K delta and in the vicinity of Teshekpuk Lake and Izembek Lagoon has a similar long-term potential.

Currently, probably less than 20 percent of the world black brant population nests in the vegetated intertidal zone of the Yukon Delta (King and Dau, 1981). Nesting densities, exceeding 1,500 nests per km<sup>2</sup>, were recorded there in the 1970's. Substantial numbers also nest on the arctic slope between Wainwright and the Colville River, and some also nest on Wrangel Island off the Siberian coast and in arctic Canada. Brant nest in colonies in the extreme coastal fringe or tidal meadows along major estuaries, generally beginning about mid-May. From late June to August, brant from the arctic slope, as well as substantial numbers from the Y-K Delta and Wrangel Island (perhaps 20-25% of the population; King and Derksen, 1987), gather in the Teshekpuk Lake/Cape Halkett area to molt and feed prior to the first stage of the southward migration. Molting Canada, white-fronted, and snow geese also are present at this time. In August, following the molt, this segment of the population migrates along the northern and western coasts of Alaska to Izembek Lagoon on the Alaska Peninsula where they join migrants from the Y-K Delta that are feeding on the extensive eelgrass beds from September to November to accumulate fat reserves necessary for completing their migration. In late October or early November, they depart essentially en masse on a nonstop flight across the North Pacific to California and Mexico. The majority (over 90%) winter in lagoons of Baja California and mainland Mexico, but small numbers may be found along the



West Coast from California to British Columbia. Prior to 1960, substantial numbers overwintered in coastal California, but these have declined precipitously as numbers have increased along the Mexican coast. Several thousand brant may overwinter in the Izembek Lagoon area. Spring migration is more gradual, and brant concentrate in numerous bays on the trip north. Brant arrive at Izembek Lagoon for spring staging in late April and early May, remaining for about 3 weeks to accumulate fat reserves before moving on to the Y-K Delta and northern nesting areas.

#### (5) Other Geese

Tule geese, a subspecies of white-fronted, nests in Redoubt Bay on the west side of Cook Inlet. The population, probably numbering no more than a few thousand, winters in three small areas of inland central California.

Taverner's Canada geese, numbering approximately 100,000 individuals, breed throughout interior Alaska and onto the Yukon Delta. A majority of these gather in fall at Izembek Lagoon with brant and emperors. Flocks of Taverner's depart sporadically for the flight across the North Pacific to the Columbia River Basin. A substantial proportion of the migrants move on to the Klamath Basin and eventually the central valley of California. Northward migration follows an inland route through British Columbia and interior Alaska.

Vancouver Canada geese (population 40,000-50,000) breed in southeast Alaska, and, being largely nonmigratory, most overwinter within 150 miles of the nesting areas. Fewer than 20 percent migrate as far south as Washington.

Dusky Canada geese, with a population of 10,000-15,000 and declining, breed primarily on the Copper River Delta. Heavy predation pressure appears responsible for much of the declining trend (15-80% of nests destroyed since 1974; Campbell et al., 1987), and the population is heavily hunted on wintering areas. Habitat changes following the 1964 Alaska earthquake altered the delta's suitability for nesting (Alaska Dept. of Fish and Game, 1986), and may be responsible for much of the high rate of predation. A small proportion of fall migrants crossing the Gulf of Alaska stop in the Queen Charlotte Islands or Vancouver Island, but most continue to wintering areas in Oregon's Willamette Valley.

Lesser Canada geese, with a population of approximately 2,000, nest in the Cook Inlet area; most winter in the Willamette Valley of Oregon.

Lesser snow geese frequenting Alaska (population about 40,000 or fewer) breed on Wrangel Island off Siberia and on Howe Island off the Sagavanirktok River Delta near Prudhoe Bay. In mid-September, they are found on St. Lawrence Island and the Seward Peninsula; in late September and October, large numbers occupy the southern Yukon Delta and intertidal areas of Ugashik Bay on the Alaska Peninsula before heading south to the Central Valley of California in late October. In addition, several hundred thousand snow geese that nest in northwestern Canada migrate to the northeastern Alaska coastal plain prior to returning east for their fall migration through Canada (Johnson et al., 1987). On the northward migration in April and May, substantial numbers occupy staging areas on Cook Inlet wetlands.

Adverse weather conditions that delay nesting can produce a major negative effect in any of these species, and increasing levels of disturbance on breeding, staging and wintering grounds have a similar potential in the long term. Those species wintering in the Lower 48 States, especially California, increasingly find traditional areas of suitable habitat no longer available; for example, only 4 percent of the original wetlands of California's Central Valley remain, and certain agricultural land uses reduce suitable habitat still further.

#### **b. Diving Ducks**

Some eighteen species of diving ducks breed in Alaska; most common are the oldsquaw (approximate population occurring in Pacific/Alaska waters, 3.6 million), common eider (750,000), king eider (1.8 million), spectacled eider (250,000), Steller's eider (400,000), black scoter (490,000), surf scoter (116,000), white-winged scoter (400,000), greater scaup (340,000), harlequin duck (1 million), Barrow's goldeneye (120,000), common goldeneye (110,000), and red-breasted merganser (20,000). Of these, mainly the eiders, oldsquaw, and scaup nest prominently in coastal areas or on islands. At present, increasing disturbance resulting from human activities is a major factor influencing habitat suitability and availability. This may range from occasional human presence to vehicle use or conversion of habitat to residential, recreational or other uses. Displaced breeders may be forced to nest in marginally suitable habitat where competition, predation, and/or disease are elevated. Also, human activities near wetlands often result in decreasing water quality. Reproductive success of any of the breeding species is affected adversely by persistence of severe weather early in the nesting period.

Most species of diving ducks that nest in Alaska are prominent residents of Alaskan coastal areas in winter. Scaup and substantial proportions of scoter, goldeneye, and merganser populations move south along the west coast of Canada and, for several species (scaup, scoters, and mergansers), as far as California. Oldsquaw, eiders, and harlequin duck, together with substantial numbers of all three scoters, bufflehead, goldeneye and red-breasted merganser, primarily remain in Alaska. Eiders and oldsquaw, in particular, winter as far north as open water is available, typically in the St. Lawrence Island polynya, but on occasion in the vicinity of the Diomed Islands in Bering Strait or as far north as Point Hope in the Chukchi Sea. The St. Lawrence Island area provides an important winter retreat for an estimated 50,000 eiders and 500,000 oldsquaw from December to May (Fay, 1961). Likewise, polynyas associated with St. Matthew and Nunivak Islands, as well as openings in the seasonal pack ice of the southern Bering Sea, support substantial numbers of king and common eider, harlequin duck, and oldsquaw (McRoy et al., 1971). Wintering common, king, and Steller's eiders, as well as oldsquaw and harlequin ducks, also are abundant in the Aleutian Islands and along the Alaska Peninsula to Kodiak Island. The latter two species are abundant in winter through southeast Alaska.

Spring migration for diving ducks that overwinter in southern localities (e.g., goldeneye, bufflehead, and mergansers) occurs from late March to late May in Gulf of Alaska staging areas such as the Copper River Delta and bays and deltas of Cook Inlet. Eiders and oldsquaw are in migration at sea in late April and May, arriving on the Yukon Delta in mid-May, the Bering Strait in mid- to late May, and off the arctic slope from late May to mid-June. Nesting for eiders breeding on the arctic tundra, barrier islands, or river deltas begins in mid-June.

Beginning in mid-July, large concentrations of oldsquaw and eider occupy coastal inshore waters where they molt prior to the fall migration. Deltas of the major arctic slope rivers also are occupied by molting waterfowl. Likewise, in the Yukon Delta region and elsewhere along this coastline, nonbreeding eiders remain in nearshore waters throughout the summer and are joined by adult males soon after incubation begins. Nearshore waters of Bristol Bay and lagoons along the north side of the Alaska Peninsula are important areas for migrating ducks. For example, Arneson (1980) reported 85,000 Steller's eiders and 51,000 scoters along the peninsula in fall.

#### **c. Waterfowl**

Important waterfowl habitat is distributed among bays, lagoons, and estuaries on the Pacific Coast. Information on various waterfowl species which may be contacted by OCS activities may be obtained by consulting Cogswell (1977) and Page et al. (1977). Predominant waterfowl which may occur in areas potentially affected by OCS activities include dabbling ducks (wood



duck, European and American widgeon, gadwall, northern shoveler, mallard, pintail and green-winged, blue-winged, and cinnamon teal) and the loons and grebes.

There are six species of these two families that are common winter visitors of nearshore waters and coastal estuaries in the Alaska/Pacific Regions. All loons and grebes prey primarily on fish by diving and underwater pursuit.

#### (1) Pacific Loon

Pacific loons (*Gavia pacifica*) are the most abundant and pelagic of the loons found off the Pacific Coast. The North American populations of this species breed on freshwater lakes along the Arctic Circle in Alaska and Canada and winter on salt water along the Pacific coast from southeast Alaska to southern Baja (Palmer, 1962; as cited in Briggs et al., 1983). Pacific loons are found in the Pacific Region throughout the year, but large numbers occur only during the fall migration (Briggs et al., 1983). Although no total populations estimates are known, the size of the Alaska population that migrate through the Pacific Region is thought to range into the hundreds of thousands. During migration, Pacific loons are commonly observed in large flocks near the coast during daylight hours.

During 3 years of survey, Briggs et al. (1983) found Pacific loons arriving in northern California waters in October, with the peak of fall migration in November. Peak numbers of fall migrants reach southern California in mid-December. Highest densities of Pacific loons were observed over continental shelf waters; most birds were found from 5 to 50 km offshore.

Briggs et al. (1983) observed that the northbound (spring) migration began in March, peaked in April, and tapered off in May. The actual turnover rate during migration is unknown. However, Briggs et al. (1987) estimate 75,000 - 290,000 birds pass through central and northern California, and 40,000 - 60,000 through southern California in spring. In fall only 5,000 - 19,000 birds are estimated to pass through central and northern California, and about 5,000 through southern California.

A small percentage of birds do not migrate south (or north) of California. Briggs et al. (1987) estimate that about 10,000 - 15,000 birds overwinter in California waters. They also estimate that only 1,000 - 5,000 birds spend spring and summer in California waters.

#### (2) Western Grebe

Western Grebes (*Aechmophorus occidentalis*) winter along coastal Pacific waters from southeast Alaska to western-central Mexico, and inland from central California and Nevada southward (Cogswell, 1977). Breeding occurs on lakes from southern British Columbia, northern Alberta, and Minnesota south to Colorado, and north and central-east California (Cogswell, 1977); small local breeding sites are known from farther east and south as far as central Mexico (Briggs et al., 1983). Total population estimates of this aquatic diving bird are unknown.

Briggs et al. (1983) observed the first migrants appearing in late September, spreading throughout their coastal range by December. Western grebes begin moving north and inland in March and are usually gone by the end of May. Peak populations along the California coast occurred from November through January, when 25,000 were estimated to be present north of Point Conception and some 27,000 birds south of the Point. (In fact, from October to May they are one of the predominant species within .5 km of the mainland.)

Western grebes occupy a narrow band of shelf water, usually dispersed within 3 km of the mainland coast. Sightings made by Briggs et al. (1983) suggested that grebes occupy the narrowest bands of coastline during moderate weather and may leave coastal waters entirely in stormy weather. Grebes are very uncommon offshore, even on nearshore islands.

#### d. Seabirds

Perhaps the most prominent and numerous avian group found in the Alaska and Pacific Regions are the pelagic (open ocean) seabirds. This group consists of birds such as shearwaters, petrels, murrelets, auklets, and gulls. These seabirds exhibit a wide array of body forms, life history patterns, and strategies for obtaining food, reproducing, and avoiding predation.

Most people are, at least, casually familiar with terrestrial birds and, as such, tend to base their understanding of seabirds upon this knowledge. Seabirds are, however, very different from terrestrial in a number of ways. Seabirds evolved in an environment free of many of the predators faced by terrestrial birds and an environment with a less predictable food source. These factors have led to the development of strategies such as: long life spans, late attainment of sexual maturity, and small clutch sizes (Sowls et al., 1980). All these factors are the exact opposite of most terrestrial species.

These aspects of the dynamics of seabird populations (especially their late breeding age and low clutch sizes) tend to make their populations particularly vulnerable to a catastrophic disturbance. Such a disturbance could impact several generations and take years to overcome.

Another characteristic of seabirds that makes them vulnerable is their colonial nesting behavior. During the breeding season, most are concentrated at only a few nesting colonies. Therefore, any disturbance at the colony has the potential to affect a large number of birds.

The Alaskan seabird population is unique in both size and species diversity. The population has been estimated at some 100 million birds of more than 75 different species from May to November. The majority of the birds (some 75 percent) remain south of the Arctic Circle. With the onset of winter in late November, the majority of birds (about 80 percent) migrate to warmer climates. Very few seabirds remain in the Chukchi and Bering Seas when these areas are ice covered from November to mid-April.

Compared to the numbers of seabirds in Alaska, the seabird population in the Pacific Region is modest at best. There are only about 1.7 million breeding seabirds in the Pacific Region.

The majority of the total seabird biomass found in the Pacific Region, however, consists of seasonal migrants. Migrating shearwaters and phalaropes number well into the tens of millions during April and May; and almost as many birds in the winter.

The affinity of seabirds towards oceanic upwellings has been known at least since Murphy (1936). The importance of upwellings is that they initiate plankton blooms which result in increased crustacean, fish, and squid production, thereby, providing an abundant food source for seabirds.

The following discussion is based primarily on Haley (1984), Ashmole (1971), Bartonek and Nettleship (1979), and Briggs et al. (1987); also, emphasis is on only those aspects of the birds life history that relate to their migration.

##### (1) Shearwaters

These birds (of order Procellariiformes) are true marine birds in that they are largely independent of land for feeding or resting and come ashore only to reproduce. In the Alaskan/Pacific area, the sooty and pink-footed shearwaters (*Puffinus griseus* and *P. creatopus*) are by far the most common. These birds breed primarily on islands off southeastern Australia and Cape Horn, South America, from November to March. After breeding, they migrate throughout the North Pacific where they winter from April to October. Wintering populations



in the North Pacific have been grossly estimated at 30 million birds each. During this time, shearwaters make up almost 90 percent of all seabirds seen in the open ocean.

In southern California, these birds tend to be found on the coolest waters: major upwelling centers stretching along the Santa Rosa-Cortes Ridge, south of Point Conception, shallow island shelves, and the western Santa Barbara Channel. North of Point Conception, they are found over the continental shelf.

These birds feed by pursuit plunging. That is, they pursue squid, crustaceans, and schooling fish by diving from the surface or plunging from the air.

## (2) Phalaropes

Phalaropes are shorebirds adapted to swimming and taking prey (primarily crustaceans and fish eggs) from the ocean surface. The northern (or red-necked) phalarope (*Phalaropus lobatus*) and the red phalarope (*P. fulicarius*) are extremely abundant in the Alaskan/Pacific Regions in April and May and again in August to October, sometimes numbering 3 to 4 million, as they pass through during their migration. These birds nest in Alaska and winter off coastal southern California to the Antarctic. During their migration, phalaropes tend to concentrate in flocks as large as a thousand near the coast in spring, over the Outer Continental Shelf and slope in the spring and fall, and seaward off the shelf in the winter. On these wintering areas, phalaropes spend most of their time on the open ocean, as opposed to wading like other shorebirds. They feed by swimming in tight circles to stir up prey and pick them from just beneath the surface.

## (3) Alcids (Murres, Murrelets, and Puffins)

Most of the breeding seabirds (about 47 percent) in the Alaska/Pacific Region belong to this family. Alcids have been called the northern ecological counterpart of penguins. Their most striking similarity with penguins is their ability to "fly" underwater in pursuit of prey by using their short, narrow wings as powerful paddles while their feet act as rudders. Some can dive up to 130 m (430 ft) in pursuit of fish, crustaceans, or mollusk. All the alcids in the Alaska/Pacific Regions generally feed in shallow waters close to shore, especially during the nesting season when they stay within a few miles of the colony. They also tend to be colonial feeders (except the murrelet), many aggregating into flocks of 10-30 at certain "hot spots." Except when incubating eggs or caring for hatchlings, birds spend very little time on land; rather, most of their time is spent on the open ocean loafing or diving for prey.

The breeding season for most alcids in the Regions is from March to July. Breeding age is usually attained at 2-3 years. Tufted puffins (*Fratercula cirrhata*), common murres (*Uria aalge*), and marbled murrelets (*Brachyramphus marmoratus*) all lay only one egg. After the breeding season (which usually has ended by August), many breeding alcids remain in the general vicinity of the breeding colony. Birds from the more northern latitudes typically migrate southward.

The common murre is probably the most colonial of the alcids. In the Pacific, they breed from the Bering Sea to central California. There are about 5 million murres in Alaska, 6,000 in British Columbia, 21,000 in Washington, 250,000 in Oregon, and some 360,000 in California.

The California subspecies is mostly sedentary, that is, they remain near the breeding colony throughout the year. Birds migrating south from British Columbia and Alaska augment resident populations from September through March with concentrations at Monterey Bay, Point Sur, Morro Bay, and the eastern Santa Barbara Channel.

Tufted puffins are found from Cape Lisburne (in NW Alaska) south to Hokkaido, Japan, and along the North American coast to the Farallon Islands offshore northern California.

The North American population numbers about 4 million most being in Alaska. These birds are only now becoming re-established in the contiguous United States after decades of population decline. Presently, only a few thousand are distributed along the coast of British Columbia, Washington, Oregon, and California.

These birds nest in large colonies and use excavated burrows in soil or rock crevices for nest sites. The breeding season is typically in May. After the breeding season, many northern breeders remain near the colony until the onset of winter and then migrate south, like most northern alcids. Puffins start appearing in peak numbers in northern and central California in March and April. In southern California, the largest numbers of birds are seen from January to May. After May, most birds return to their northern breeding colonies.

Marbled mureletts breed along the North American coast from the Aleutian Islands to central California. (In Asia, they are found from Siberia, south to Korea, Japan, and the Kurile Islands.) In North America these birds are more common on the north end of their breeding range. More than 50,000 breeding pairs occur in Alaska; Washington has 1,900-3,500 breeding pairs; Oregon has an estimated 2,400; and the California population estimate is less than 1,000 breeding pairs. They are currently under petition to be listed as a threatened species in Washington, Oregon, and California (53 FR 40479, October 17, 1988).

Only very recently has the breeding biology of marbled mureletts become known. (It was not until 1975 that the first nest was found.) They do not nest in colonies. Nests have been found mostly in Alaska and mainly on steep slopes. From southeast Alaska south, only two nests have been found, those being in old-growth conifer trees. Nesting occurs from mid-April to late September. Little is known about the distribution of post-breeding birds, except that they likely remain near the breeding area throughout the year.

#### e. Shorebirds

Shorebird is a term typically applied to that group of birds that occupy the narrow strip of habitat on the coastline, bays, lagoons, and estuaries. In this discussion, it applies to birds of the plover, sandpiper, and avocet families (Charadriidae, Scolopacidae, and Recurvirostridae, respectively). Predominant shorebirds in the Alaska/Pacific Regions include plovers, sandpipers, turnstones, snipes, and stilts. The following discussion on shorebirds is based largely on Pitelka (1979) and Recher (1966).

Shorebirds are found in greatest numbers and diversity in the tidal flats (mudflats and sandflats) of sloughs, estuaries, and lagoons where they feed primarily by probing the substrate for invertebrates. Some shorebirds (e.g., stilts and yellowlegs), however, feed in the water column rather than the substrate. The coastal rocky intertidal zone and open sandy beach support fewer species (and numbers) of shorebirds. Most shorebirds are typically true migrants. In the North Pacific, shorebirds mostly migrate from northern breeding areas in Alaska to southern wintering areas (in some cases as far south as southern Chile).

There are four aspects of shorebird migration that are noteworthy. First, shorebirds generally "hold" at certain staging areas prior to taking the next migrational leap. Secondly, the spring migration is generally tighter (i.e., takes place in a shorter amount of time) than the fall migration. Third, there appears to be some site tenacity for wintering grounds as birds generally return to the same area year after year. Lastly, inter- and intra-specific competition on staging areas is reduced by staggering the times of migration. That is, shorebird migration is not a gradual increase and then decrease in the number of migrants. Rather, it is a secession of peak numbers within: groups of species, various age classes, and various sexes into and out of the staging area.



A variety of coastal bird populations are found occupying the sandy beaches, rocky shores, estuaries, and wetlands (marshes, sloughs, and bays) of the Alaska/Pacific Regions. Available habitat in some areas (especially California) for these species has been greatly reduced over the last several decades due to urban and recreational development projects. Large percentages of California's coastal wetlands have disappeared, resulting in the loss of valuable habitat to several coastal birds which are dependent on wetlands for their survival. Although wetlands provide important feeding and resting areas for hundreds of coastal dependent and migratory bird species, this loss of habitat has had the most severe impact on those species which are dependent on wetlands for nesting.

One of the most abundant shorebirds in the Alaskan/Pacific Region is the western sandpiper (*Ereunetes mauri*). This species was chosen as a representative of the dozens of species of shorebirds that migrate and disperse through the Regions.

The prime breeding range of the western sandpiper is the Y-K Delta and the Seaward Peninsula. Following the breeding season (May - August), birds migrate south to winter along the Pacific Coast from California to Peru. The number of migrating sandpipers has been estimated at approximately 5 to 6.5 million.

Both spring and fall migrations takes place in a series of "hops" to staging areas, where birds spend time feeding heavily to store up fat for the sustained nonstop flight to the next staging area. Some important staging areas along the migration route include: the Cooper/Bering River Deltas (near Valdez, Alaska); Vancouver Island, British Columbia; Puget Sound, Washington; Humboldt Bay, California; San Francisco Bay, California; and San Quintine Bay, Baja California.

#### **D. Fish Resources**

##### **1. Pacific Salmon**

Five species of anadromous Pacific salmon spawn in streams rivers of the Alaska and Pacific Regions and migrate either through planning areas within the or between the regions. These five species include: chinook, coho, chum, pink, and sockeye salmon. The distribution and life history characteristics of these species are well described by Hart (1973) and other sources. Adults of each species spawn in freshwater streams, rivers, and/or lakes where their eggs are deposited in gravel nests and remain until hatching. Newly-hatched young undergo early development in freshwater for a variable period of time, but eventually the young salmon migrate downstream, undergo a physiological process called smoltification, and then enter the ocean as juveniles. Juvenile salmon spend from one to several years in the ocean environment where they may undertake a lengthy migration for feeding purposes, mature into adults, and then migrate back to their stream or river of origin to spawn.

As Pacific salmon undergo these life history changes they occupy a variety of habitats and utilize a wide range of prey organisms (MBC 1987). Important feeding habitats for young smolts or juveniles include estuaries, nearshore coastal areas, and open ocean areas relatively close to shore and their home stream. As salmon grow in size they move progressively further offshore where they feed on larger prey organisms and mature into adults. Important prey organisms of salmon in estuarine and coastal habitats include various planktonic crustaceans such as amphipods, euphausiids and crab larvae, insects and small fishes such as sand lance and other juvenile salmon (MBC 1987). In the open ocean, larger juveniles and adult salmon feed on prey such as squid, euphausiids and a wide range of fishes, including herring, sand lance, anchovy and rockfish (MBC 1987).

Chinook salmon stocks spawn in rivers and streams extending from the Sacramento-San Joaquin River system in central California to Point Hope, Alaska (Frey, 1971). Adult chinook enter streams or rivers in so-called spawning runs throughout the year at least somewhere in their range (Hart, 1973). Some rivers have only a single run, whereas others such as the Columbia or Sacramento River in the Pacific Region may have several separate runs (MBC, 1987). Chinook salmon runs in the Pacific Region occur in the fall (August through November), summer (June through August) and spring (March through May). The Sacramento River also supports a unique winter (November to February) spawning run of chinook salmon. Coho salmon stocks spawn over a similar geographic range that extends from Monterey Bay in central California to Nome, Alaska (MBC, 1987). Important spawning streams or rivers occur in central California, northern California, and Washington/Oregon area for both Chinook salmon (Allen and Hasler, 1986; Frey, 1971; MBC, 1987; and Pacific Fishery Management Council [PFMC], 1984) and Coho salmon (Hasler, 1987; Lanfle et al., 1986).

Chum and pink salmon typically spawn in streams from northern California through the Bering Sea in Alaska (Hart, 1973). Sockeye salmon, however, generally spawn over a more restricted geographic range that typically extends from the Columbia River northward through Bristol Bay in Alaska (Hart, 1973). Within the Pacific Region, therefore, spawning and production of these species are largely restricted to streams located in Washington/Oregon area (Hart, 1973; Pauley et al., 1988). Pink salmon typically begin their freshwater spawning run in September or October, with chum salmon beginning their run in the late fall, winter, or spring. Generally, chum salmon are the last of the five species of salmon to enter freshwater on their spawning run. Sockeye generally begin their spawning run during the summer.

According to the PFMC (1982 and 1984) the long-term trends for many salmon stocks in California, Oregon, and Washington have been towards lower levels of abundance when compared with the historically high levels of stock abundance. In 1981, the PFMC considered most chinook and coho stocks in the Pacific Region to be in a depressed condition, with a declining trend in abundance. More recent information from the PFMC on the status of major chinook, coho, and pink salmon stocks originating in California, Oregon, and Washington indicates that at least some stocks have increased in abundance over the past few years as a result, in part, of more stringent management by the PFMC.

The major factors considered responsible for declining stock abundance, and the continuing difficulty in restoration, have been increased fishing pressure and environmental or habitat degradation (PFMC, 1984). Hatchery production which is used to heavily supplement weak natural stocks may reduce the genetic complexity and resistance of natural stocks, as well as contribute to the generation of continued fishing pressure (PFMC 1984). Fishing pressure on these salmon stocks occurs primarily within the Pacific Region, but may also occur as fish pass through Canadian and Alaskan waters, or even on the high seas by foreign nations, during the course of their oceanic migration. Habitat degradation and/or loss affecting many salmon stocks has occurred as a result of water diversions for agriculture and development, dam construction and sedimentation from forestry, and other construction activities. The PFMC (1984), for example, estimated in 1981 that about 60 percent of the historically suitable spawning habitat along the Columbia River had been destroyed as a result of these factors.

Salmon of all species spend from one to several years in the ocean environment where they may undertake a lengthy migration, feed and mature into adults, and then migrate back to their stream or river of origin to spawn. In the Pacific Region, most chinook salmon originating from the Sacramento/San Joaquin River system in the central California area and coastal streams in the northern California area move northward along the coast, at least to Vancouver Island (MBC, 1987; PFMC, 1982). The extent of the northward movement is thought to fluctuate considerably depending upon ocean conditions, food availability and the individual stock.



Some fish from this system apparently also move southward into the Monterey Bay area, as well as further south (Allen and Hasler, 1986). Some evidence suggests that fall-run chinook remain relatively close to their natal streams during their ocean residence, while spring-run chinook move further northward (Allen and Hasler, 1986). Most fish originating from coastal streams and rivers in the Washington/Oregon also move northward to British Columbia, and southeast Alaska, and may eventually be caught as adults offshore British Columbia, Washington, Oregon, and northern California (PFMC, 1982). Chinook produced from streams in the Puget Sound are thought to move into waters offshore British Columbia, but not much further northward. Similarly, Columbia River chinook, depending upon the run, move northward to British Columbia or southeast Alaska while some fish also eventually occur off Oregon and northern California. Chinook salmon smolts and juveniles are heavily dependent on estuarine habitat, and individuals from some stocks may spend up to 2 months in this habitat (Shepard 1981, as cited in Allen and Hassler (1986). Chinook salmon remain in the ocean for 1-5 years, although most return to their natal streams or rivers to spawn after 3-4 years (Allen and Hasler, 1986). The PFMC (1982) illustrates generalized oceanic migratory patterns for chinook stocks originating from streams or rivers in California, Oregon, and Washington.

The offshore migratory patterns of coho salmon originating from streams in California, Oregon, and Washington are also illustrated in Hassler (1987) and Laufle et al. (1986). Most coho salmon produced from streams in California appear to remain closer to their home river than do chinook, and to migrate only as far northward as Oregon and Washington. Coho originating from streams in Oregon appear to move at least as far north as British Columbia. Coho originating from Washington and British Columbia streams exhibit two types of migratory behavior; some migrate long oceanic distances, and others remain closer to their home stream. Coho that undergo long oceanic migrations apparently concentrate in the Gulf of Alaska in the summer and then eventually disperse coastward. Adult coho generally spend two growing seasons at sea before returning to their streams of origin for spawning.

The offshore oceanic migration and distribution of both chum and pink salmon extend into waters off British Columbia and southeast Alaska, as well as into the Gulf of Alaska (Hart, 1973). Chum salmon may remain in the ocean for 2-7 years; however, most of those produced in Oregon and Washington return to spawn after 3-4 years. In contrast, pink salmon have a unique 2-year life cycle with genetically isolated even and odd year runs, resulting in an oceanic residence of less than 2 years. Sockeye salmon juveniles and adults produced from the Washington/Oregon area in the Pacific Region migrate northward and offshore into waters off British Columbia, southeast Alaska, and possibly the Gulf of Alaska and along the Aleutian Chain (Hart, 1973). Most sockeye salmon remain in the ocean for 2 years before migrating back to their natal streams to spawn.

## 2. Walleye Pollock

The range for walleye pollock extends continuously around the continental shelf areas of the northern Pacific Ocean and Bering Sea. In the Northeast Pacific, walleye pollock extend from St. Lawrence Island (south of the Bering Strait) throughout the Bering Sea, through the Gulf of Alaska, and along the northeastern Pacific coast to central California (Hart, 1973; Smith, 1981).

Pollock are the most abundant demersal fish on the continental shelf of the Bering Sea. Their populations declined in the early 1970's because of overharvesting by foreign fisheries, but slowly increased to a standing stock biomass of approximately 7.5 million tons by 1979 (Thorsteinson, 1984). The Bering Sea stock is currently stable, although smaller than prior to its decline (Sale 92 FEIS, DOI, MMS, 1985). In the Gulf of Alaska, a large, dense group of prespawning and spawning pollock was discovered in the Shelikof Strait area in 1980 (Sale 88 FEIS, DOI, MMS, 1984). Since that date, pollock have been fished in the Shelikof Strait, and

the total biomass of pollock has declined substantially. The reasons for this decline are not known, but overfishing and poor recruitment are both possibilities. In the past, it was believed that pollock from the entire central and western Gulf of Alaska migrated to the Shelikof Strait in the spring (Draft Resource Assessment Document for the 1989 Gulf of Alaska Groundfish Fishery, 1988). If so, then the population of pollock in the Gulf of Alaska could be at a very low level. It is also possible that the premise of extensive concentration in the Shelikof Strait from a much broader area is not valid.

At least in the eastern Bering Sea, pollock undergo seasonal and diurnal migrations associated with spawning and feeding. Their distribution appears to be related to water temperature (Morris, 1981). Overwintering occurs along the outer shelf and upper slope at depths of 150 to 300 meters, where bottom temperatures are warmer (Morris, 1981). As water temperatures rise in the spring, pollock move to more shallow waters (90 m to 140 m), where they spawn. From March through July, spawning occurs along the outer shelf, with major concentrations between the Pribilof Islands and Unimak Island (Lewbel, 1983). Following spawning along the southeastern Outer Continental Shelf, the northwest drift apparently carries larvae and metamorphosing juveniles to the vicinity of the Pribilofs (Smith, 1981). By 1 year of age, pollock are distributed broadly over the entire central and Outer Continental Shelf, completely overlapping the adult range, but also extending inshore beyond the adult range (Smith, 1981). By 2 years of age, pollock are more restricted to deep water (Smith, 1981). As they mature at ages 3 to 4 years, juveniles join the adult demersal population on the Outer Continental Shelf.

### 3. Steelhead Trout

Steelhead trout (*Oncorhynchus mykiss*) are sea-run (i.e., anadromous) rainbow trout that primarily use coastal streams and rivers from Central California to the Bering Sea and Bristol Bay in Alaska for spawning. Important spawning streams occur in northern California, Oregon, and Washington (Barnhart, 1986; Pauley et al., 1986). Two general races, or runs of steelhead exist: winter-run and summer-run. Winter-run steelhead migrate to and enter their natal streams in the late fall, winter, and spring (November through April), whereas summer-run steelhead migrate upstream during the spring, summer, and fall (May through October). Steelhead may enter some large rivers, such as the Klamath, Sacramento and Columbia, throughout most of the year. California stocks apparently consist almost entirely of winter-run steelhead because of unsuitable summer stream conditions; however, Oregon, Washington, and southern British Columbia stocks are comprised of both summer and winter runs. Winter-run steelhead enter their home stream and normally spawn within the next few months. In contrast, summer-run fish enter their home stream in a non-reproductive condition, and do not mature and spawn until the following spring. Steelhead spawning generally occurs from February to late June, depending upon the type and location of the run, and is similar to salmon spawning. Unlike salmon, however, steelhead do not die following spawning, and may reproduce several times.

In freshwater habitats, steelhead feed primarily on the aquatic stages of insects (Barnhart 1986). In estuarine and nearshore marine habitats, steelhead feed on prey organisms similar to those utilized by Pacific salmon. As steelhead grow larger and move further offshore they feed on larger prey such as fish, squid and crustaceans (Barnhart 1986).

The abundance of steelhead in California has declined dramatically since the 1950's due primarily to the damage or loss of freshwater and estuarine fish habitat, and the increased mortality to smolts from such activities as dam construction and operations, water diversion, other types of construction, and generally poor land management practices (Barnhart, 1986). According to Barnhart (1986), increased sport fishing intensity has contributed to the reduced abundance of steelhead. In California, attempts are underway to maintain existing natural stocks of steelhead and their spawning and rearing habitats, to restore or enhance presently



degraded habitats, and to supplement natural production with hatchery-produced steelhead (California Department of Fish and Game, 1975, as cited in Barnhart, 1986). In some rivers, steelhead production and fisheries would be nonexistent without hatchery produced stocks. A similar situation exists in Oregon and Washington where steelhead abundance has declined from excessive sportfishing pressure and habitat loss and/or degradation (Pauley et al., 1986). In particular, the presence of dams and reservoirs, which cause loss of natural habitat and increased mortality of outmigrating smolts, has contributed greatly to the serious reduction of steelhead produced from Columbia River stocks (Pauley et al., 1986). Other factors contributing to the decline of steelhead include poor logging, road building and irrigation practices, and overgrazing by livestock. As in California, natural steelhead runs are heavily supplemented by hatchery stocking in Oregon and Washington. In the mid-1970's, for example, seventeen hatcheries on the Columbia River planted steelhead smolts to supplement the remaining natural production (Ayerst, 1977). According to NOAA letter, November 3, 1989, there are currently 29 facilities that release steelhead into the Columbia River. This includes 12 Oregon Department of Fish and Wildlife facilities, 2 Idaho Department of Fish and Game facilities, 11 Washington Department of Fisheries facilities, and 4 U.S. Fish and Wildlife facilities.

In the Pacific Region most steelhead smolts enter the ocean between March and June. Juvenile and adult steelhead normally reside in the ocean for 1-4 years (usually 1-2 years for fish originating from California, and 2-3 years for fish from Oregon and Washington). In general, the length of the marine residence increases from south to north. Steelhead originating in Washington and Oregon spend at least a portion of their ocean residency in the Alaskan gyre system, although it is less clear whether fish from California move as far north. Tag-recapture data presented in Pauley et al. (1986) show that steelhead originating from streams in the Pacific Region may migrate as far north as southeast Alaska and the Gulf of Alaska, as well as along the Aleutian Chain before returning to their natal streams to spawn.

#### 4. Pacific Whiting

Pacific whiting (*Merluccius productus*) range from Baja California to the Gulf of Alaska; however, adult whiting are uncommon north of Hecate Strait, British Columbia, and are most abundant between the Columbia River and Monterey Bay, California. At least three subpopulations of Pacific whiting exist, with the major subpopulation centered off California, Oregon, and Washington. Adult Pacific whiting are found up to 400 km from shore off southern California, 300 km from shore off central California, and over the shelf and slope from there northward. Although juvenile and adult whiting may be found near the ocean surface, they are most abundant at depths in excess of 90-100 m. However, they are often near bottom associated with the continental shelf and slope (MBC 1987). Spawning of Pacific whiting occurs from Baja California to Cape Mendocino in northern California; in Puget Sound, Washington; and further north in the Straits of Georgia offshore British Columbia (MBC, 1987). Spawning schools typically occur at depths of 130-500 m, with spawning taking place from January to May. The eggs and larvae of whiting are found primarily at depths greater than 50 m (MBC, 1987). Peak spawning occurs in January and February, and possibly into March.

The diet of Pacific whiting varies substantially depending upon the size and age of individual fish, the season, and their location. In general, juveniles and adults feed on euphausiids, shrimp, and fishes such as herring, anchovy, smelt (MBC 1987). Typically, younger whiting feed on crustaceans such as euphausiids, while older and larger hake utilize fishes as prey (MBC 1986). As discussed below, the migration pattern undertaken by Pacific whiting is from spawning areas located primarily off southern California to coastal feeding areas located off central and northern California, Oregon and Washington. In addition to this coastwide

movement, whiting also undergo a diel vertical migration in search of euphausiid prey organisms at night (MBC 1987).

According to MBC (1987), fish-scale deposits in the southern California Bight suggest that the Pacific whiting subpopulation off California, Oregon, and Washington has undergone considerable natural fluctuations in abundance over the past 200 years. In the early 1900's, for example, the whiting population was evidently larger than at present based on this fish scale data. The Pacific whiting is a long-lived species, with several year classes contributing to the adult population and the commercial fishery at any given time. However, year class strength of whiting is highly variable and has been directly correlated to the existence of favorable environmental conditions at the time of spawning and early larval development (PFMC, 1987). For example, research fishing surveys conducted by the California Department of Game over the past 20 years indicate that strong year classes of whiting were produced in 1967, 1970, 1973, 1977, 1980, 1984, and 1986. In contrast, the same data suggest that year class failures occurred in 1981 and 1983. Historical catch data suggest that these dominant year classes support the commercial fishery for whiting. Analysis of fishery catch data from 1985-86 and the 1986 research fishing survey data from the California Department of Fish and Game suggest that the whiting population and fishery are presently dominated by young fish from the 1984 and 1986 year classes, and that the 1984 year class was extremely large (i.e., nearly 60 percent of population abundance and 37 percent of biomass estimates) (PFMC, 1987). These data suggest that over the next several years, the subpopulation of whiting centered off California, Oregon, and Washington will be at a high level of abundance. Future fluctuations in the abundance of this whiting subpopulation will most likely be related to the presence or absence of favorable environmental conditions at the time of spawning and early larval development, the frequency of strong year classes that tend to dominate the subpopulation, and the intensity of domestic and foreign commercial fishing pressure on the stock.

The northern spawning subpopulations of whiting in the Puget Sound and the Straits of Georgia are relatively sedentary and undertake only limited coastwide movements during the year (MBC, 1987). In contrast, the subpopulation of whiting centered offshore California, Oregon, and Washington undertakes an extensive annual migration from spawning areas in the south to feeding areas in the north. Adults form spawning aggregations in the winter (January through March), primarily in the Southern California Planning Area (SCPA) and northern Baja California. Following spawning, whiting begin migrating northward in April towards coastal feeding areas that occur as far north as Vancouver Island off British Columbia. In May and June, whiting concentrate over the continental slope; by late June and July, they move inshore to depths of 100 m or less. Important coastal feeding areas for the aggregation of juvenile and adult whiting occur off central California, northern California, Oregon, and Washington. In July and August, whiting move offshore again and begin to migrate southward. The timing of this movement appears to be linked with the seasonal development of the Davidson current off California, Oregon, and Washington (MBC, 1987). The southward migration takes place primarily in the fall, with spawning aggregations beginning to form in December offshore southern California.



# **CHAPTER IV**

## **ENVIRONMENTAL CONSEQUENCES**

## **IV. Environmental Consequences**

### **A. Introduction**

This section is a discussion of the basic assumptions used in the cumulative impact analysis, the potential generic impacts that can result from OCS activities, and the potential cumulative impacts to migratory species whose migration routes traverse more than one planning area in the Alaska and Pacific Regions.

The SEIS tiers directly from the FEIS, and, therefore, incorporates by reference all materials contained in the FEIS Chapter IV, ENVIRONMENTAL CONSEQUENCES (pages IV.A.-1 to IV.B.22.-24). In some instances, the assumptions from the FEIS were modified to comply with the court's remand to "consider the effect of simultaneous inter-regional development on migratory species," and to reflect the alternative selected by the Secretary of the Interior as well as the current status of the 5-Year Leasing Program, Mid-1987 to Mid-1992.

The previous assumptions (FEIS Proposed 5-Year Program, Sections IV.A.1 through IV.A.4.b, pages IV.A.-1 to IV.A.-47) have been summarized below. These assumptions include estimates of the conditional oil and gas resources on the OCS and hypothetical scenarios of exploration, development and production activities. Assumptions concerning the likelihood of oil spill occurrences (based on historical spill rates and the conditional resource estimates) from OCS exploration, development, production and transportation activities were also made.

Discussions of the potential generic impacts of OCS-related oil and gas activities presented in the FEIS Proposed 5-Year Program Sections IV.A.4.c. through IV.A.10 (pages IV.A.-48 to IV.A.-117) have also been summarized. These summaries focus on those potential generic impacts which are relevant to the cumulative impact analysis of the migratory species. These discussions are not projections of expected impacts. Rather they are descriptions of the kinds of effects to which the migratory species are susceptible.

Information on projects considered in the cumulative impact assessment previously presented in the beginning of Environmental Consequences By Planning Area (Section IV.B.) for each planning area was restructured and is presented by Region. This describes the existing activities and reasonably foreseeable projects and proposals along the migration routes of the migratory species within the Alaska and Pacific Regions. These projects have been updated to reflect any changes in their current status.

The analysis of the cumulative impacts on migratory species within the FEIS (Sections IV.B.7 through IV.B.21) has also been restructured. The cumulative impact analysis is presented in a single coherent section rather than fragmented by planning area.

The cumulative impact analysis in the SEIS assumes the implementation of all mitigating measures required by statute and/or regulation. As part of the 1987 Program, stipulations were highlighted which provide levels of protection similar to those included in Sales No. 73 and No. 80 for California are assumed. However, it is still assumed that the current process for development of lease stipulations will continue. During the consultation and analysis process that precedes each OCS lease sale, the need for additional mitigating measures will be identified, and lease stipulations which provide the necessary mitigation of potential adverse impacts will be developed and adopted for each lease sale, as appropriate.



## **B. Basic Assumptions and Significant Impact Producing Agents**

### **1. Resource Estimates**

As part of the initial steps in the preparation of the 5-Year Leasing Schedule, the potential oil and gas resources within each planning area were assessed. Using all relevant available geologic and geophysical data and the PRESTO Model, a regional assessment of the planning areas was completed. Estimates of the conditional undiscovered, economically recoverable resources and their associated marginal probabilities were derived for each planning area. The major elements constituting PRESTO and the method used in developing the probabilistic oil and gas resource estimates for the planning areas are described in OCS Report MMS 85-0012.

The conditional resource estimates for the FEIS are quantities of oil and gas resources that may be found and developed, given the condition that economically recoverable accumulations of hydrocarbons are present in the planning areas. The marginal probabilities which correspond to these resource estimates represent the chance that economically recoverable hydrocarbons exist in the planning areas.

Since the SEIS tiers directly from the FEIS, and in order to maintain consistency in the analysis between the two documents, the same conditional mean resource estimates (see Table IV.B.1-1 in the SEIS and Table IV.A.1-2 in the FEIS) for the cumulative case scenario are used. The conditional resource estimates for the cumulative case include estimates of total leased and unleased resources, and the total developed and undeveloped reserves in the planning areas. A detailed discussion of the resource estimates associated with the cumulative case scenario is contained in Section II.B.1.d of the SEIS.

### **2. Exploration and Development Assumptions**

Table II.B.1-1 represents the level of offshore activity which may result from the exploration, the delineation of possible hydrocarbon bearing formations, and the establishment of production platforms. The estimates of infrastructure associated with these conditional resources were developed for evaluating the potential levels of impacts. The level of offshore activity as a result of the cumulative case scenario is detailed in Section II.B.1.e of the SEIS.

### **3. Projected Transportation and Markets**

#### **a. Introduction**

This section summarizes the basic assumption made in the FEIS Section IV.A.3 (pages IV.A.19 to IV.A.25), concerning how oil and gas production will be transported to shore and whether production will be transported by tanker or pipeline to markets inside or outside of the planning areas. The present analysis is limited to examining issues related to the transport of product among domestic market areas. Table IV.B.4-1 presents the specific transportation mode scenarios used in the cumulative analysis. For consistency with the FEIS, the same transportation modes and assumptions were made. The allocation of the percentage of pipelines versus transportation by tankers in a planning area is based on the assumptions presented in this section and existing transportation networks.

In analyzing the availability of transportation networks to deliver oil and gas to demand areas, both current and proposed networks were reviewed for all OCS planning areas.

As a result of this analysis, the decision whether to use pipelines, barges, or tankers to transport OCS oil and gas to shore is dependent on a number of factors, including technological constraints, environmental preferences, and economic considerations. The exact mode of transport cannot be determined until the amount of recoverable reserves is known and judgments are made as to what is environmentally preferable and technically and economically feasible.

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Table IV.B.1-1 Conditional Oil and Gas Resources, Reserves, and Infrastructure  
for the FEIS and SEIS Cumulative Case

| PLANNING AREA     | OIL<br>(MMBBL) | GAS<br>(BCF) | MILLION<br>BOE | MP <sub>HC</sub> * | NUMBER OF               |                          | PLATFORMS |
|-------------------|----------------|--------------|----------------|--------------------|-------------------------|--------------------------|-----------|
|                   |                |              |                |                    | EXP. &<br>DEL.<br>WELLS | DEV. &<br>PROD.<br>WELLS |           |
| Beaufort Sea      | 1280           | —            | 1280           | 0.70               | 38                      | 126                      | 3         |
| Chukchi Sea       | 2680           | —            | 2680           | 0.20               | 85                      | 263                      | 7         |
| Hope              | 170            | 1810         | 492            | 0.02               | 13                      | 49                       | 1         |
| Norton            | 640            | 2940         | 1163           | 0.15               | 45                      | 112                      | 4         |
| Navarin           | 4800           | 5840         | 5839           | 0.27               | 179                     | 569                      | 14        |
| St. George        | 1690           | 15760        | 4494           | 0.22               | 147                     | 444                      | 12        |
| N. Aleutian       | 360            | 2620         | 826            | 0.20               | 26                      | 80                       | 2         |
| Shumagin          | 50             | 1420         | 303            | 0.03               | 11                      | 30                       | 1         |
| Kodiak            | 150            | 2920         | 670            | 0.05               | 24                      | 66                       | 2         |
| Cook Inlet        | 210            | 350          | 272            | 0.03               | 11                      | 25                       | 1         |
| Gulf of Alaska    | 540            | 8340         | 2024           | 0.08               | 63                      | 200                      | 5         |
| Washington/Oregon | 180            | 3260         | 760            | 0.20               | 33                      | 90                       | 3         |
| N. California     | 420            | 1860         | 751            | 0.60               | 33                      | 88                       | 3         |
| C. California     | 300            | 560          | 400            | 0.65               | 21                      | 46                       | 2         |
| S. California**   | 2613           | 4087         | 3340           | 1.00               | 524                     | 2145                     | 48        |

\* MP<sub>HC</sub> denotes marginal probability of commercial hydrocarbons.

\*\* Includes developed and undeveloped reserves. The infrastructure for the Southern California Planning Area includes existing, proposed and hypothetical platforms and development and production wells.

Resource estimates are less an amount of resources from areas eliminated from the 5-year program because of deferrals.

Estimates of levels of exploration and development expressed in this table are based solely on the conditional resource level of the planning areas and are therefore, themselves conditional estimates.

MMBBL - Millions of Barrels

BCF - Billion Cubic Feet

BOE - Barrels of Oil Equivalent

Based on previous analyses and completed projects, oil companies generally prefer pipelines for transporting oil and gas to processing facilities when economics and other considerations justify their construction. Where pipelines cannot be justified, tankers or barges are necessary. In California, although pipelines have almost always been used, in some instances tankers are preferred by the oil industry. Tankers, in some cases, allow greater flexibility in terms of getting oil to refineries and market centers.

**b. Transporting Oil and Gas Resources to Shore**

Pipelines are generally used to bring oil and gas to shore in the Southern California Planning Area. However, tankers are employed in Southern California in a variety of situations to transport oil to refineries. The expansion of the offshore oil and gas pipeline systems in Southern California is expected to continue as a result of several large production projects currently being considered. Support facilities within Southern California are being consolidated to minimize pipeline landfalls. Therefore, the percentage of pipelines used versus tankers is higher. The percentage of oil production transported by tanker in Southern California reflects production prior to pipeline completions and the possible production from fields which cannot use pipelines for economic, physical (water depth), or environmental reasons.

In areas where there is currently no production, alternatives to a pipeline transportation system may be required. It was assumed, based on current geologic information, that oil resources in the Washington and Oregon, Northern California, and Central California Planning Areas would be transported by tanker to shore.

Since there is no oil and gas production on the OCS within the Alaska Region, the transportation systems are still speculative. However, for analysis purposes a separate transportation network was identified for each of the three Alaskan subregions. For the Beaufort Sea; Chukchi Sea; and Hope Basin Planning Areas, oil is expected to be transported through subsea and overland pipelines to the Trans-Alaskan Pipeline System (TAPS), where it would be routed to the Valdez tanker terminal (See SEIS, Section IV.C). Anticipated OCS oil production is not likely to exceed TAPS capacity and is expected to replace production from the Alaskan North Slope (ANS) which is estimated to decline in the late 1990's.

Consideration was given to icebreaking tankers as a viable option to pipelines in many of the planning areas in Alaska, including the western portion of the Chukchi Sea and Hope Basin. Overall, tanker transportation may be an economically viable option selected by industry in Alaska.

In the second subregion, oil transportation for Alaska encompasses possible production within the St. George Basin, Norton Sound, Navarin Basin, and the North Aleutian Basin Planning Areas. Transportation projections for these areas feature a series of gathering and truck lines feeding into a central offshore or onshore terminal. Icebreaking shuttle tankers would be used to move the oil to an ice-free deepwater port on the South Alaskan peninsula for shipment. As an alternative, the potential OCS production from the North Aleutian Basin could be piped directly to the terminal. Another alternative being considered by industry is the use of ice-breaking tankers to transport the product directly to market, thus minimizing the problems associated with unloading and reloading. The transportation of oil in the Bering Sea, however, would require the construction of new tanker facilities.

In the third subregion, oil production from the Shumagin Basin; Kodiak; Cook Inlet; and Gulf of Alaska Planning Areas, would be moved through subsea pipelines to storage facilities prior to being transported by tankers to market. Some new tanker facilities would likely be required.



There is currently no system available to transport natural gas from the Prudhoe Bay area to the contiguous United States. The Alaskan Natural Gas Transportation System (ANGTS) has been proposed to carry North Slope and Canadian natural gas to the lower 48 States. A portion of the pipeline is currently completed and is delivering gas from north of Calgary, Alberta, Canada, to Iowa and Oregon. However, the Alaskan and northern Canadian section of the pipeline remain unbuilt. Another pipeline, the Trans-Alaskan Gas System (TAGS), has been proposed and partially approved to transport the North Slope gas to Valdez, Alaska, for processing and transportation. In the absence of a gas pipeline, other gas transportation systems are being considered including liquefaction of natural gas (LNG) (See SEIS, Section IV.C.).

#### c. Transportation to Markets

Section IV.A.3.c. of the FEIS provides a detailed discussion on the Petroleum Administration for Defense District (PAD) V (Alaska, Hawaii, Washington, Oregon, California, Arizona, and Nevada) refinery capacity, assumptions, and calculations associated with the allocation of the oil from the Alaska and Pacific Regions.

The current capacity of existing transportation networks does not pose a major constraint to further subarctic offshore production. Modification to the network will be made when economically viable hydrocarbons are discovered. The availability of current transportation networks will facilitate the development of offshore resources. Restrictions in offshore development will be the environmental and economic costs associated with establishing and operating the transportation system. Transportation costs and availability are carefully considered when evaluating the economic feasibility of every hydrocarbon discovery. Resource development will not occur unless the hydrocarbons can be economically transported to regional and national markets.

Specific assumptions are made to allocate OCS oil production between West Coast and Gulf Coast refineries. These assumptions were based on a forecast of the PAD refining capacity. Both onshore and offshore production from California, Oregon, and Washington are allocated to PAD V refineries.

Alaskan oil is then allocated to the remaining PAD V refinery capacity. Alaskan production not refined in PAD V is expected to be delivered to the Gulf Coast area for refining. Part of this excess is expected to be transported by pipeline. There are presently two proposed pipelines in various stages of the permitting process (See SEIS, Section IV.C.): the All American Pipeline, and the Pacific-Texas Pipeline. For purposes of this analysis, it is assumed that these pipelines will be operational by 1995 for the transportation of PAD V oil.

There has been some concern expressed that the low-gravity, high sulfur oil found offshore California and the low-gravity crude from the Alaska North Slope could not be refined in most California refineries. Some California refineries are currently being modified to handle the oil from these areas.

### 4. Oil Spills

#### a. Oil Spill Analysis

The same assumptions concerning oil spills based on historical spill rates and the conditional resource estimates in the FEIS are used for the SEIS. The oil spill model data for the cumulative case are summarized and presented in Table IV.B.4-1. Since the publication of the FEIS, OCS platform, OCS pipeline and worldwide tanker oil spill occurrence rates have been updated (Anderson and LaBelle (1988)). The OCS platform and pipeline rates are significantly reduced from those of Stewart (1975, 1976) and Lanfear and Amstutz (1983) while worldwide tanker rates have not changed since Lanfear and Amstutz (1983). However, it was

Table IV.B.4-1  
The Cumulative Case  
Estimated Mean Number of Oil Spills Greater than 1,000 Barrels and Probability of One or More Spills(1)

| PLANNING AREAS      | CONDITIONAL OIL RESOURCES |       | TRANSPORT. MODE(2) | ESTIMATEAD SPILLS FROM OCS PRODUCTION IN PLANNING AREAS |          |           |           |       | ESTIMATE TANKER SPILLS FROM |       |                |       |         |       | TOTAL SPILLS ESTIMATED FROM ALL SOURCES |       |
|---------------------|---------------------------|-------|--------------------|---------------------------------------------------------|----------|-----------|-----------|-------|-----------------------------|-------|----------------|-------|---------|-------|-----------------------------------------|-------|
|                     | MMBBL                     | MPHC* |                    | PLAT. EM#                                               | PIPE EM# | TANK. EM# | TOTAL EM# | PROB. | PROPOSAL OCS TRANSPORT**    |       | OTHER DOMESTIC |       | IMPORTS |       | EM#                                     | PROB. |
|                     |                           |       |                    |                                                         |          |           |           |       | EM#                         | PROB. | EM#            | PROB. | EM#     | PROB. |                                         |       |
| WASHINGTON/OREGON   | 180                       | 0.20  | T                  | 0.18                                                    | 0.00     | 0.23      | 0.41      | 0.34  | 0.09                        | 0.09  | 0.72           | 0.51  | 1.93    | 0.85  | 3.16                                    | 0.96  |
| NORTHERN CALIFORNIA | 420                       | 0.60  | T                  | 0.42                                                    | 0.00     | 0.27      | 0.69      | 0.50  | 0.00                        | --    | 0.00           | --    | 0.00    | --    | 0.69                                    | 0.98  |
| CENTRAL CALIFORNIA  | 300                       | 0.65  | T                  | 0.30                                                    | 0.00     | 0.39      | 0.69      | 0.50  | 0.36                        | 0.30  | 1.51           | 0.78  | 1.42    | 0.76  | 3.98                                    | 0.98  |
| SOUTHERN CALIFORNIA | 2613                      | 1.00  | 34T66P             | 2.61                                                    | 2.76     | 1.15      | 6.53      | 0.99+ | 0.25                        | 0.22  | 2.49           | 0.92  | 2.81    | 0.94  | 12.08                                   | 0.99+ |
| GULF OF ALASKA      | 540                       | 0.08  | P+T                | 0.54                                                    | 0.86     | 0.35      | 1.76      | 0.83  | 0.93                        | 0.61  | 6.55           | 0.99+ | 0.00    | --    | 9.24                                    | 0.99+ |
| KODIAK              | 150                       | 0.05  | P+T                | 0.15                                                    | 0.24     | 0.10      | 0.49      | 0.39  | 0.00                        | --    | 0.00           | --    | 0.00    | --    | 0.49                                    | 0.39  |
| COOK INLET          | 210                       | 0.03  | P+T                | 0.21                                                    | 0.34     | 0.14      | 0.68      | 0.49  | 0.00                        | --    | 0.00           | --    | 0.00    | --    | 0.68                                    | 0.49  |
| SHUMAGIN            | 50                        | 0.03  | P+T                | 0.05                                                    | 0.08     | 0.03      | 0.16      | 0.15  | 2.14                        | 0.88  | 0.00           | --    | 0.00    | --    | 2.31                                    | 0.90  |
| NORTH ALEUTIAN      | 380                       | 0.20  | P+T(3)             | 0.36                                                    | 0.58     | 0.00      | 0.94      | 0.61  | 0.00                        | --    | 0.00           | --    | 0.00    | --    | 0.94                                    | 0.61  |
| ST. GEORGE          | 1690                      | 0.22  | 50T50P+T(4)        | 1.69                                                    | 1.35     | 0.55      | 3.59      | 0.97  | 0.63                        | 0.47  | 0.00           | --    | 0.00    | --    | 4.22                                    | 0.99  |
| NAVARIN             | 4800                      | 0.27  | P+T+T(5)           | 4.80                                                    | 7.68     | 0.96      | 13.44     | 0.99+ | 0.00                        | --    | 0.00           | --    | 0.00    | --    | 13.44                                   | 0.99+ |
| NORTON              | 640                       | 0.15  | P+T+T(5)           | 0.64                                                    | 1.02     | 0.13      | 1.79      | 0.83  | 0.00                        | --    | 0.00           | --    | 0.00    | --    | 1.79                                    | 0.83  |
| HOPE                | 170                       | 0.02  | P+T(6)             | 0.17                                                    | 0.27     | 0.00      | 0.44      | 0.36  | 0.00                        | --    | 0.00           | --    | 0.00    | --    | 0.44                                    | 0.36  |
| CHUKCHI SEA         | 2680                      | 0.20  | P+T(6)             | 2.68                                                    | 4.29     | 0.00      | 6.97      | 0.99+ | 0.00                        | --    | 0.00           | --    | 0.00    | --    | 6.97                                    | 0.99+ |
| BEAUFORT SEA        | 1280                      | 0.70  | P+T(6)             | 1.28                                                    | 2.05     | 0.00      | 3.33      | 0.96  | 0.00                        | --    | 0.00           | --    | 0.00    | --    | 3.33                                    | 0.96  |

EM# - Estimated Mean Number of Spills.

MPHC - Marginal Probability of Commercial Hydrocarbons.

\*\* Estimated mean number of oil spills in the planning area as a result of the transportation of oil developed in the other planning area.

- Oil spills greater than or equal to 1,000 bbls are considered to be governed by a Poisson process (Smith, and others, 1982; Lanfear and Amstutz, 1983); thus the probability of a specific number of spills ( $P(n)$ ) occurring is described by the Poisson distribution:  $P(n) = e^{-a} a^n / n!$ , where  $n$  is the specific number of spills (0, 1, 2, ...,  $n$ ),  $e$  is the base of natural logarithms and  $a$  is the mean of the Poisson distribution. The probability of one or more spills is calculated as  $1 - P(0)$  or simply  $1 - e^{-a}$ .  
The probabilities for one or more spills associated with the total number of spills in each planning area is calculated as  $1 - e^{-a}$ , where  $a$  is the sum of the means for each source of spills. This calculation assumes independence between spills from the various sources of spills (e.g., platforms and tankers).
- The transportation mode symbols have the following meanings: T, 100 percent tanker; P, 100-percent pipeline; 25T75P, 25 percent tanker, 75-percent pipeline; P + T, 100-percent pipeline followed by another 100-percent tanker, and 50T50P + T, 50-percent tanker, 50-percent pipeline followed by 100-percent tanker.
- All oil from the North Aleutian Planning Area will move via pipeline to Shumagin where it will be loaded onto tankers for shipment to the lower 48 States.
- One-half of the oil from St. George will be loaded onto tankers for shipment to the lower 48 States. One-half of the 1.3 spills/billion bbls for this tanker shipment is assigned to St. George and the other one-half to the planning area that receives the oil. The other one-half of St. George oil will be piped to Shumagin where it will be loaded onto tankers for shipment to the lower 48 States. Pipeline spillage is assigned to St. George, and one-half of the tanker spillage is assigned to Shumagin, with the planning areas that receive the oil having the other half of the expected tanker spillage.
- All oil from the Norton and Navarin Planning Areas will be transported by ice breaking tankers to the Shumagin Planning Area where it will be off-loaded and loaded onto tankers for shipment to the lower 48 States. One-half of the expected spillage from the ice breaking leg is assigned to Shumagin as is one-half of the expected spillage from the tanker leg to the lower 48 States. The other half of the expected spillage during the ice breaking tanker leg is assigned as follows: 0.20 spills/billion bbls to area of production (half in-port spills) and 0.45 spills/billion bbls (one-half of the at-sea spills) to St. George.
- All oil from the Beaufort, Chukchi and Hope Planning Areas will be piped to shore, use the Trans Alaska pipeline and then tanker shipment out of the Gulf of Alaska Planning Area. One-half of the 1.3 spills/billion barrels for tankers is assigned to the Gulf of Alaska Planning Area and the other one-half is assigned to the planning area that receives the tanker shipment.

determined for this analysis that to maintain consistency between the SEIS and the FEIS the same spill rates for platforms and pipelines would be used. Based on professional judgement, the lower spill rates would result in a reduction of the total estimated mean number of oil spills and therefore, would also result in potentially lower levels of impacts to the migratory species analyzed.

Since the publication of the FEIS, the *Exxon Valdez* struck Bligh Reef in the Prince William Sound on March 24, 1989 releasing over 242,000 barrels of crude oil into the Sound. The oil slick has spread over 10,000 square miles and contacted 700 miles of shoreline (Trustee Council - draft August 1989 report "State/Federal Natural Resource Assessment Plan for the *Exxon Valdez* Oil Spill"). From April 14 through April 29, a team of investigators from the Center for Marine Conservation visited many of the areas affected by the spill and interviewed government officials, scientists, fishermen conservationists, and persons involved in the cleanup. Based on their investigation a report was submitted "A Management Analysis of the *Exxon Valdez* Oil Spill" to the Center for Marine Conservation. Experts are currently assessing the short and long term environmental and economic implications of the incident.

The original assumptions for the cumulative scenario included the volume of crude oil transported by tankers from Valdez. This volume (see Section IV.C.9.c.) was taken into consideration during the generation of the data for the oil spill table (Table IV.B.4-1). The estimated mean number of spills attributed to crude oil transportation from TAPS is 7 spills with a probability of greater than 99 percent that one or more spills would occur. Therefore, the analysis in the SEIS, takes into consideration the *Exxon Valdez* spills and potential future spills as a result of the transportation of oil originating from TAPS.

Additional assumptions were made to take into consideration the court's remand to analyze simultaneous development. The analysts assumed that two large (greater than 1,000 bbls) oil spills would occur in a given year as a result of OCS activities. Each spill would be in a different planning area. The analyst selected two planning areas for the location of these oil spills where the estimated mean number of spills for the 5-year program was greater than one, and where critical activities (life history) or areas for the migratory species existed.

Again, for the purpose of analysis it was assumed that the number of oil spills (see Tables IV.B.4-2, IV.B.4-3, and IV.B.4-4) in each planning area would occur within uniform frequency within that planning area over the 35- to 40-year life of the cumulative scenario.

Oil spills are considered one of the single greatest potential impacting agents to the environment from offshore oil and gas activities. As a result, MMS has developed the Oil Spill Risk Analysis Model (OSRAM) (LaBelle, 1986; LaBelle, et al., 1983; Smith, et al., 1982; Lanfear, et al., 1979) as a tool to aid in the overall understanding of the potential risk of oil spills to the environment from specific offshore oil and gas lease sales. A more detailed description of the OSRAM is contained in the reports above, as well as in the FEIS, Section IV.A.4 (pages IV.A-25 to IV.A-41).

The oil-spill modeling approach for the FEIS was to use the estimated number of oil spill occurrences (greater than or equal to 1,000 (bbls) and the estimated probability of one or more spills (greater than or equal to 1,000 bbls) occurring.

The model used in this analysis categorizes spills into volume classes; however, only oil spills greater than or equal to 1,000 bbls are considered. Most spills are in the range of 1-1000 bbls (with 99 percent of the spills less than or equal to 10 bbls), and are usually the result of transferring or lightering operations.

Another important assumption is that the model incorporates the historical oil spill accident rates and assumes that these rates can be used to estimate future spills. The accident data are



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**Table IV.B.4-2**  
**Total Number of Oil Spills Assumed for Each Planning**  
**for the SEIS Cumulative Case**

| PLANNING AREA     | OIL<br>(MMBBL) | MP <sub>HC</sub> * | TOTAL ESTIMATED SPILLS<br>FROM OCS PRODUCTION |       |            | TOTAL ESTIMATED SPILLS<br>FROM ALL SOURCES |       |            |
|-------------------|----------------|--------------------|-----------------------------------------------|-------|------------|--------------------------------------------|-------|------------|
|                   |                |                    | EM#                                           | PROB. | ASSUMED*** | EM#                                        | PROB. | ASSUMED*** |
| Beaufort Sea      | 1280           | 0.70               | 3.33                                          | 0.96  | 3          | 3.33                                       | 0.96  | 3          |
| Chukchi Sea       | 2680           | 0.20               | 6.97                                          | 0.99+ | 7          | 6.97                                       | 0.99+ | 7          |
| Hope              | 170            | 0.02               | 0.44                                          | 0.36  | 0          | 0.44                                       | 0.36  | 0          |
| Norton            | 640            | 0.15               | 1.79                                          | 0.83  | 2          | 1.79                                       | 0.83  | 2          |
| Navarin           | 4800           | 0.27               | 13.44                                         | 0.99+ | 13         | 13.44                                      | 0.99+ | 13         |
| St. George        | 1690           | 0.22               | 3.59                                          | 0.97  | 4          | 4.22                                       | 0.99  | 4          |
| N. Aleutian       | 360            | 0.20               | 0.94                                          | 0.61  | 1          | 0.94                                       | 0.61  | 1          |
| Shumagin          | 50             | 0.03               | 0.16                                          | 0.15  | 0          | 2.31                                       | 0.90  | 2          |
| Kodiak            | 150            | 0.05               | 0.49                                          | 0.39  | 0          | 0.49                                       | 0.39  | 0          |
| Cook Inlet        | 210            | 0.03               | 0.68                                          | 0.49  | 1          | 0.68                                       | 0.49  | 1          |
| Gulf of Alaska    | 540            | 0.08               | 1.76                                          | 0.83  | 2          | 9.24                                       | 0.99+ | 9          |
| Washington/Oregon | 180            | 0.20               | 0.41                                          | 0.34  | 0          | 3.16                                       | 0.96  | 3          |
| N. California     | 420            | 0.60               | 0.69                                          | 0.50  | 1          | 0.69                                       | 0.50  | 1          |
| C. California     | 300            | 0.65               | 0.69                                          | 0.50  | 1          | 3.98                                       | 0.98  | 4          |
| S. California**   | 2613           | 1.00               | 6.53                                          | 0.99+ | 7          | 12.08                                      | 0.99+ | 12         |

\* MP<sub>HC</sub> denotes marginal probability of commercial hydrocarbons.

\*\* Includes developed and undeveloped reserves. The infrastructure for the Southern California Planning Area includes existing, proposed and hypothetical platforms and development and production wells. Estimates of levels of exploration and development expressed in this table are based solely on the conditional resource level of the planning areas and are therefore, themselves conditional estimates.

\*\*\* Based on the estimated mean number of oil spills and the probability that one or more oil spills would occur (probability greater than .40), it was assumed that a spill would occur.

MMBBL - Millions of Barrels

EM# - Estimated Mean Number of Oil Spills



**Table IV.B.4-3**  
**Total Number of Oil Spills Assumed for Each Planning**  
**for Alternative II**

| PLANNING AREA     | OIL<br>(MMBBL) | MP <sub>HC</sub> * | TOTAL ESTIMATED SPILLS<br>FROM OCS PRODUCTION |       |            | TOTAL ESTIMATED SPILLS<br>FROM ALL SOURCES |       |            |
|-------------------|----------------|--------------------|-----------------------------------------------|-------|------------|--------------------------------------------|-------|------------|
|                   |                |                    | EM#                                           | PROB. | ASSUMED*** | EM#                                        | PROB. | ASSUMED*** |
| Beaufort Sea      | 1280           | 0.70               | 3.33                                          | 0.96  | 3          | 3.33                                       | 0.96  | 3          |
| Chukchi Sea       | 2680           | 0.20               | 6.97                                          | 0.99+ | 7          | 6.97                                       | 0.99+ | 7          |
| Hope              | 170            | 0.02               | 0.44                                          | 0.36  | 0          | 0.44                                       | 0.36  | 0          |
| Norton            | 640            | 0.15               | 1.79                                          | 0.83  | 2          | 1.79                                       | 0.83  | 2          |
| N. Aleutian       | 360            | 0.20               | 0.94                                          | 0.61  | 1          | 0.94                                       | 0.61  | 1          |
| Shumagin          | 50             | 0.03               | 0.16                                          | 0.15  | 0          | 2.31                                       | 0.90  | 2          |
| Kodiak            | 150            | 0.05               | 0.49                                          | 0.39  | 0          | 0.49                                       | 0.39  | 0          |
| Cook Inlet        | 210            | 0.03               | 0.68                                          | 0.49  | 1          | 0.68                                       | 0.49  | 1          |
| Gulf of Alaska    | 540            | 0.08               | 1.76                                          | 0.83  | 2          | 9.24                                       | 0.99+ | 9          |
| Washington/Oregon | 180            | 0.20               | 0.41                                          | 0.34  | 0          | 3.16                                       | 0.96  | 3          |
| N. California     | 420            | 0.60               | 0.69                                          | 0.50  | 1          | 0.69                                       | 0.50  | 1          |
| C. California     | 300            | 0.65               | 0.69                                          | 0.50  | 1          | 3.98                                       | 0.98  | 4          |
| S. California**   | 2613           | 1.00               | 6.53                                          | 0.99+ | 7          | 12.08                                      | 0.99+ | 12         |

\* MP<sub>HC</sub> denotes marginal probability of commercial hydrocarbons.

\*\* Includes developed and undeveloped reserves. The infrastructure for the Southern California Planning Area includes existing, proposed and hypothetical platforms and development and production wells. Estimates of levels of exploration and development expressed in this table are based solely on the conditional resource level of the planning areas and are therefore, themselves conditional estimates.

\*\*\* Based on the estimated mean number of oil spills and the probability that one or more oil spills would occur (probability greater than .40), it was assumed that a spill would occur.

MMBBL - Millions of Barrels

EM#- Estimated Mean Number of Oil Spills

Table IV.B.4-4  
Total Number of Oil Spills Assumed for Each Planning  
for Alternative III

| PLANNING AREA | OIL<br>(MMBBL) | MP <sub>HC</sub> * | TOTAL ESTIMATED SPILLS<br>FROM OCS PRODUCTION |       |           | TOTAL ESTIMATED SPILLS<br>FROM ALL SOURCES |       |           |
|---------------|----------------|--------------------|-----------------------------------------------|-------|-----------|--------------------------------------------|-------|-----------|
|               |                |                    | EM#                                           | PROB. | ASSUMED** | EM#                                        | PROB. | ASSUMED** |
| Beaufort Sea  | 1280           | 0.70               | 3.33                                          | 0.96  | 3         | 3.33                                       | 0.96  | 3         |
| Chukchi Sea   | 2680           | 0.20               | 6.97                                          | 0.99+ | 7         | 6.97                                       | 0.99+ | 7         |
| Navarin       | 4800           | 0.27               | 13.44                                         | 0.99+ | 13        | 13.44                                      | 0.99+ | 13        |

\* MP<sub>HC</sub> denotes marginal probability of commercial hydrocarbons.

\*\* Based on the estimated mean number of oil spills and the probability that one or more oil spills would occur (probability greater than .40), it was assumed that a spill would occur.

MMBBL - Millions of Barrels

EM#- Estimated Mean Number of Oil Spills

separated into three modes: production (platforms), pipelines, and tankers. The historical oil-spill rates from U.S. OCS activities (Gulf of Mexico and Southern California) are used to estimate spills from production and pipelines, and the worldwide tankering spill rate is used to estimate spills from tanker transportation. The model assumes that half of the spills from tankers will occur in the study area if the tanker route extends beyond the study area.

Table IV.B.4-1 provides the planning areas and associated conditional oil resource estimates and marginal probability of hydrocarbons in column one, the remaining columns present the results of the model. The group of columns headed "Spills From OCS Activities Within Planning Areas" present the estimated number of spills (1,000 bbls or greater) within each planning area from development and transportation of the conditional oil resource estimates for each planning area. The columns headed "Tanker Spills From OCS Transport" provide the estimated number of spills in the planning area as a result of the transportation of oil developed in the other planning areas. The column headed "Tanker Spill From Other Domestic" reports the estimated number of spills based upon the estimated volumes of domestic oil, other than OCS oil, expected to move via tankers and barges between U.S. ports over a 30-year period. The column head "Tanker Spills from Imports" provides the estimated number of spills based upon the volume of imports over a 30-year period when distributed between planning areas using the historical average percentages of imports by planning area. All data concerning estimated future domestic non-OCS oil production and imports were provided by the Department of Energy.

**b. Oil Spill Cleanup and Containment**

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP or Plan) is required by section 105 of the Comprehensive Environmental Response, Compensation, and Liability Act; and by section 311(c)(2) of the Clean Water Act, as amended; and by 33 U.S.C. §1321(c)(2). The Plan provides for a coordinated and integrated response by Departments and Agencies of the Federal Government to protect the environment from pollution. It specifies the division of responsibilities among the Federal, State, and local governments in response to an oil or hazardous substance discharge. A detailed discussion of the various oil spill cleanup and containment equipment and their effectiveness is contained in Section IV.A.4.b (pages IV.A.-41 to IV.A.-45) of the FEIS. A review of the events and decisions leading up to the *Exxon Valdez* oil spill, and the response of industry and government to the spill is contained in (Townsend, and Heneman, 1989) which is incorporated by reference.

**c. Fate of Oil in the Marine Environment**

The nature of impacts from oil spills in the marine environment depends largely on the nature and proportions of the oil's chemical components. Weathering processes, in turn, largely depend on oceanographic and meteorologic factors at the time of the spill. A detailed description of the fate of oil in the marine environment is contained in Section IV.A.4.c. (pages IV.A.-46 to IV.A.-52) in the FEIS.

**d. Oil Spill Impacts on the Biological Environment**

This section of the SEIS tiers directly from Section IV.A.4.d (pages IV.A.-52 to IV.A.-73), FEIS, and incorporates by reference all the information contained in that section. Generic oil-spill impacts on the migratory species are described in Section IV.A.4.d of the FEIS were taken into consideration during the cumulative impact analysis in the SEIS. A detailed discussion on the potential generic impacts associated with oil spills is presented in the FEIS. A brief summary of some of these potential generic impacts, as they relate to the migratory species, is provided.

The severity of oil pollution on different organisms in various habitats varies from no effect to responses of avoidance, decreased activity, physiological stress, and death. Different species



react differently, and different life stages of an organism show different sensitivities to petroleum hydrocarbons. Lethal effects of the soluble aromatic hydrocarbons from bioassay range from 1.0 to 100 parts per million (ppm) for most adult marine organisms and from 0.1 to 1.0 ppm of the more sensitive larval and juvenile life stages. Sublethal effects may occur from soluble aromatic concentrations ranging from 0.1 to 100 parts per billion (ppb) (NRC, 1985).

Although numerous variables may affect toxicity tests, some general patterns of sensitivity to hydrocarbons are evident. In short-term exposure, the sensitivity of marine organisms generally increases from lower invertebrates (echinoderms, mollusk, annelids) to higher invertebrates (crustaceans, hemicordates) to fish. Some correlations can also be made between the sensitivity of marine organisms to hydrocarbons.

Pelagic fish and invertebrates tend to be most sensitive to hydrocarbons, while benthic and subtidal species are moderately sensitive. The intertidal fish and invertebrates are generally the least sensitive. Marine organisms in the intertidal environment that are exposed to a greater range of naturally occurring environmental factors (temperature, salinity, oxygen) may be physiologically and morphologically better prepared to accommodate an additional stress factor such as petroleum hydrocarbons. Those organisms occupying the more uniform benthic and pelagic environments may be less capable of accommodating to additional stress from the input of petroleum hydrocarbons.

The ecological significance of these responses is important at the population and community levels. Species may be proven sensitive to oil in the laboratory, but in the natural environment an entire population may recover rapidly because of factors such as effective reproduction and dispersal strategies and immigration. Conversely, although an individual organism may show high tolerance to oil contamination in the laboratory, recovery of that population under natural conditions may never occur or may be delayed due to factors such as competition for food and space or dependence on a specific food resource.

#### (1) Oil Spill Impacts on Marine Mammals

The most likely effects of oil on marine mammals based on laboratory research (Geraci and St. Aubin, 1985; Goodale, et al., 1981; and Gruber, 1981) are (a) a mild deleterious but reversible effect on the skin; (b) possible eye irritation, which would be reversible unless exposure was prolonged; (c) possible short-term baleen fouling (baleen whales) with possible feeding reduction for 1 or 2 days; (d) possible blowhole fouling and death due to respiratory stress for very young animals in heavy oil; and (e) temporary food reduction or contamination, and oil ingestion. Potential but unlikely effects include: (a) possible mortality due to respiratory stress; (b) possible immediate mortality to young or already stressed animals due to ingestion of oil or inhalation of vapors; and (c) possible mortality due to stress if individuals are already stressed.

#### (2) Oil Spill Impacts on Birds

Birds which spend much time on the sea surface are especially vulnerable to oil spills (King and Sanger, 1979). Mortality results primarily from hypothermia as oil mats the plumage destroying the thermal barrier. Direct contact by birds with oil of appreciable amounts is usually fatal.

Abnormalities in bird reproductive physiology and behavior resulting from ingestion of oil potentially could have substantial adverse effects on egg production in seabird and water fowl populations (Hartung and Hunt, 1966; Stickel and Dieter, 1979; Ainley et al., 1981; Homes, 1984; Peakall et al., 1981; and Gorsline and Homes, 1982). In addition, transfer of oil from adults to eggs results in reduced hatchability, increased incidence of deformity, and reduced growth rates in young birds (Grau et al., 1977; Albers, 1978; and Szaro et al., 1978). Holmes et al. (1978) have shown that stress from ingested oil can compound ordinary environmental

stress. Presumably, the effects of external oiling would also be more severe when birds are under environmental (eg., winter) or physiological (eg., molting) stress.

### (3) Oil Spill Impacts on Fish Resources

A detailed description of oil spill impacts on fish resources is contained in Section IV.A.4.d(3) (pages IV.A.-61 to IV.A.-63). Additional detailed information and further references on the effects of oil on fish resources can be found in Malins and Hodgins, 1981, Teal and Howarth, 1984; Rice et al., 1984; NRC, 1985 Anderson et al., 1986 and Capuzzo, 1987. The effects of oil on fish resources varies. The majority of studies on the lethal and sublethal effects of hydrocarbons on fish have been conducted in the laboratory rather than the field, and exposure doses were unrealistically high. It is difficult to extrapolate the results from laboratory to field conditions. The nature of the long-term effects of hydrocarbons is dependent on the persistence and availability of the hydrocarbons, the fate of metabolized products, and the interference of hydrocarbons with metabolic processes that affect the potential for survival and reproduction. Specific chronic effects include impairment of feeding, growth, development, energetics, and recruitment. These effects may lead to changes in community structure and dynamics, and alterations in reproductive and developmental success.

Oil spills have been shown to kill adult fish, contaminate fish, and reduce the growth of fish, and perhaps decreasing fish recruitment (Howarth, 1987). Teal and Howarth (1984) suggests that although adult fish can be killed by oil spills, this probably poses less of a threat to commercial fisheries than does damage to eggs and larvae, or changes in the ecosystem supporting the fishery. According to Evans and Rice (1974), the impacts on fishery resources from hydrocarbons can also result from the reduction of prey species.

Egg and larvae mortalities are critical because these early life stages are often planktonic and, therefore, unable to avoid spills. In addition, toxicity thresholds are lower at these stages. Adults are not resistant to the effects of an oil spill; however they exhibit greater toxic resistance and responses rather than direct mortality. Such responses to oil spills often include avoidance behavior (Nelson-Smith, 1973; Weber et al., 1981) or sublethal responses which are difficult to evaluate. There is even some evidence suggesting that fish do not always avoid areas of contamination (Blumer, et al., 1971; Gooding, 1971). Studies of actual open-water spills have concluded there has been no detectable reduction in fishery harvest as a result of these spills (MacIntyre, 1982; Sherman and Bush, 1978; NAS, 1985).

Salmonids are more sensitive than benthic fish species to hydrocarbon exposure (Wilson, 1972; Rice, et al., 1979). Newly emerged salmon fry are the most susceptible life stage (Rice, et al., 1975; Moles, 1979). Pelagic adults in the upper water column may contact an offshore oil spill or the water-soluble fraction below a spill and experience mortality or sublethal effects.

Spilled oil could have a significant impact on salmon and other anadromous fishes. These fish use chemical clues to return to their spawning streams (Fry, 1973); oil therefore, could interfere with their olfactory senses. Impacts could be especially severe during smolting, when the young fish first enter the ocean, and when adults try to locate their home drainage before smoltification spawning.

Studies have shown that various life stages of salmon can detect even sublethal hydrocarbon concentrations (Rice, 1973; Weber, et al., 1981) and may avoid such areas. Avoidance of home spawning streams due to an oil spill which contacted estuarine areas could have an adverse effect on part of a population by reducing spawning. Malins, et al., (1978) found that salmon's homing ability was delayed, but not prevented, by contact with hydrocarbons.



## 5. Noise and Other Disturbances

This section of the SEIS tiers directly from Section IV.A.7, (pages IV.A.-73 to IV.A.-110) FEIS and incorporates, by reference, all the information contained in that section. The information presented in Section IV.A.7 was taken into consideration during the cumulative impact analysis for the SEIS. A detailed discussion on the potential generic impacts associated with noise and other disturbances is found in the FEIS. However, a brief summary of some of these potential generic impacts as they relate to the migratory species is provided.

Noise emissions resulting from offshore development are associated with the operation of offshore platforms, drilling rigs, seismic, geophysical surveying, petroleum transfer facilities, onshore processing plants, pump stations, aircraft and vessel and as a result of cleanup and containment activities. In addition, construction equipment used during the installation of the various facilities emits various amounts of noise. The degree of noise impact depends upon the emitted sound level and the proximity of the source.

The response of animals to acoustic stimuli has generally shown variability in behavioral and physiological effects, depending on species studied, characteristics of the stimuli (i.e., amplitude, frequency, pulsed, or nonpulsed), season, ambient noise, previous exposure of the animal, physiological or reproductive state of the animal, and other factors. Possible adverse effects from loud sounds include: (1) auditory discomfort due to loudness/pressure changes; (2) possible hearing loss; (3) the potential masking of sounds that might be used in intraspecies communications; (4) behavioral responses resulting in avoidance of an area; and (5) decreased feeding ability.

### a. Marine Mammals

Subsea noise may affect marine mammals by disturbing or alarming them and causing them to flee the sound source. Intense noise could damage the hearing of marine mammals or cause them other physical or physiological harm (Geraci and St. Aubin, 1980; Hill, 1978). Frequent and/or intense noise that causes a flight or avoidance response could permanently displace the animals from important habitat areas.

The presence of sea lion, elephant seal, and cetacean populations in proximity to human activity and marine-vessel traffic along the California coast and the presence of sea lions, seals, and beluga whales near commercial fishing traffic in Bristol Bay and Cook Inlet in Alaska strongly suggest that some marine mammals have adjusted to human activities with no apparent adverse effects. However, some species of marine mammals, such as fur seals, are probably more sensitive to human presence and disturbance, particularly during the nursing and breeding seasons.

A task force report on geophysical operations in 1982 found there was no evidence to suggest that airguns and other nonexplosive acoustic sources cause injury to marine mammals, including gray whales.

### b. Coastal and Marine Birds

Human activities associated with exploration, development, and production, especially air and vessel traffic near nesting waterfowl and seabirds, could reduce productivity of some species and may cause abandonment of important nesting, feeding, and staging areas. The responses of birds to human disturbances vary. These responses depend on the species, physiological or reproductive state of the birds, distance from the disturbance, type, intensity, duration of the disturbance, and many other factors. Waterfowl nesting on deltas and islands may also be disturbed by aircraft and vessel traffic.



Helicopter and vessel traffic servicing drilling rigs or platforms would constitute the most important source of disturbance affecting marine birds. Onshore activities near seabird colonies and waterfowl and shorebird staging and nesting areas can disrupt breeding activities and preparation for migration. Nesting birds may be subjected to increased predation pressure from predatory species which have adapted to human presence. Construction operations of onshore facilities may encroach upon wildlife habitat, causing nearby breeding areas to be abandoned.

Low flying aircraft, especially helicopters, can frighten large numbers of cliff nesting birds from the nesting ledges, resulting in displacement of eggs and/or young. Disturbance of birds in important feeding, staging, and wintering areas can cause excessive expenditure of energy and displacement of less favorable habitats during critical periods in the migration cycle.

#### **c. Fish Resources**

Use of airguns is prevalent and is relatively harmless to fish (Weaver and Wienhold, 1972; Falk and Lawrence, 1973). However, airguns can harm a small percentage of fish eggs that are within 0.2 m from the source (Kostyuchenko, 1973; Holliday et al., 1987). Water guns, which will be used for high-resolution surveys, produce much less energy than airguns and are not known to have any effect on fish. High explosives, although rarely used, can be lethal to fish and can result in rupture of the swim bladder, abdominal cavity, blood vessels, and internal organs, and in tearing of muscle tissue (Falk and Lawrence, 1973).

### **C. Projects Considered In Cumulative Impact Assessment**

This section describes non-OCS projects and proposals and existing oil and gas infrastructures which are part of the existing environment or are reasonable foreseeable future actions. The SEIS tiers on the FEIS and incorporates by reference those projects and proposals that were previously considered during the cumulative impact analysis in Section IV.B for each planning area. The following discussion is a summary of these projects and proposals which have been updated to reflect any changes in their status.

#### **1. Dredging and Marine Disposal Activities**

##### **a. Alaska Region**

The Snake River which enters the Norton Sound at Nome is dredged annually. Approximately 13,000 cubic yards of sediment are removed each year and deposited about 1/2 mile east of the mouth of the river. These dredge spoils are contaminated by mercury that was released into the environment during the years that mercury was used for the processing of gold. Data that have recently been made available have led the Environmental Protection Agency to review the decision to use this offshore disposal site. Nome Harbour sediments were tested by the Army Corps of Engineers (COE) and the EPA in 1989 and were found to contain measurable levels of a number of chemical constituents. The COE and EPA are reviewing the new information with regards to suitability of the material for continued ocean disposal.

##### **b. Pacific Region**

In the Pacific Region a variety of materials have been and are being dumped offshore: dredge spoils, low level radioactive wastes; obsolete munitions, and industrial and municipal wastes. Ocean dumping of acceptable waste materials is authorized under Title I of the Marine Protection, Research and Sanctuaries Act of 1972, as amended (33 U.S.C. §1401), and the Federal Water Pollution Control Act, as amended (33 U.S.C. §1251). The EPA administers the designation and management of ocean disposal areas and permits for dumping of all acceptable wastes except dredged materials. Sections IV.B.7 (pages IV.B.7-3 to IV.B.7-5), IV.B.8 (pages IV.B.8-2 and IV.B.8-3), IV.B.9 (pages IV.B.9-4 to IV.B.9-6), and IV.B.10 (pages IV.B.10-3 to IV.B.10-6), of the FEIS contain a detail description of the location and

the wastes designated for disposal at these sites. The COE administers the permit program for transportation of dredged materials for ocean disposal, with independent review and concurrence by EPA.

## 2. Commercial Fisheries

### a. Alaska Region

Waters off the coast of Alaska support some of the most productive fisheries in the world. In 1986, the ex-vessel value of Alaskan commercial fisheries totaled about \$955 million. The salmon fishery was valued at \$404 million, with a 5-year (1982-1986) average value of \$354 million. Fisheries for groundfish, primarily pollock, sablefish, sole, cod, and other flounders, were valued at about \$268 million. The shellfish fishery, mainly for crab, while below recent former harvest levels, has experienced increasing price levels and was valued at \$182 million (NPFMC, 1989). The ex-vessel value of the 1986 herring harvest was \$39 million (T.Smith, NPFMC, 1989, personal communication).

All Alaska OCS Planning Areas support commercial fishing to some degree, although the fisheries in the Beaufort and Chukchi Sea Planning Areas are of relatively minor importance. To some degree, all coastal communities in Alaska derive economic benefit from commercial fishing; however, in landings and value, Dutch Harbor, Kodiak, Naknek, Cordova, Sitka, and Petersburg rank as the major fishing ports in the Region.

Alaskan commercial fisheries employ gillnets, seines, and trolling gear for harvesting salmon; longlines for halibut, sablefish, and rockfish; and trawls for other groundfish. Pots of various types are used in the crab fisheries. The limited spring and summer herring roe/bait fisheries also employ gillnets and purse seines.

In addition to the commercial fisheries there are saltwater coastal sport fisheries for salmon, halibut, and other marine fishes. Sport fishermen also harvest shellfish (crab, shrimp, and clams). While of lesser economic value than commercial fisheries, the value of the sport fishery is significant and projected to increase rapidly with the growth in population. For example, a sport fishing economic study for South Central Alaska, where most of the states population is concentrated, showed that angler expenditures associated with all sport fishing in South Central Alaska were estimated at \$127.1 million in 1986 (Jones and Stokes Associates, Inc., 1987).

### b. Pacific Region

#### (1) Pacific Salmon

The major species of salmon caught by commercial and sport fisheries offshore California, Oregon and Washington are chinook, coho and pink salmon. Long-term (1971-1988), coastwide (i.e., California, Oregon and Washington) commercial and sport landings data have been summarized by the PFMF (1989) for these three species. Chinook and coho landings within this area declined substantially between 1971-1985; however, in recent years the total chinook and coho landings have been increasing. Between 1986-1988, for example, the total area-wide landings of chinook increased from approximately 1.4 to 2.1 million fish, while the landings of coho have ranged from approximately 880,000 to 1.1 million fish.

Although highly variable between species and individual stocks, the ocean harvest of salmon may represent a substantial portion of runs that support one or more stocks in any given year. For example, the harvest rate of chinook produced from the central valley (i.e. Sacramento-San Joaquin system) of California from 1970-1987 has been estimated to range from 50 to nearly 80 percent of the total run (i.e., the estimated catch plus the estimated escapement). A substantial area-wide reduction in landings for both species, largely as a result of El Nino



conditions, occurred from 1983-85. This effect was especially pronounced in Oregon and Washington.

Pink salmon landings, which run on an odd-year cycle in the Pacific Region, increased throughout the 1970's to a peak in 1979, but have subsequently decreased. In recent years, area-wide landings of pink salmon ranged from 42,000 in 1987 to 171,000 fish in 1985.

The majority (50-60 percent) of chinook are landed and presumably caught in California, with the remainder landed in Washington and Oregon. In contrast, the vast majority of coho are caught and landed in Washington and Oregon, with relatively smaller numbers taken in California. Pink salmon are landed principally in Washington, with relatively small numbers of fish from Oregon and virtually none from California. Over the period from 1971-1985, the vast majority (70-80 percent) of chinook, coho and pink salmon landed area-wide have been taken by the commercial troll fishery, with the balance taken by sport fishermen.

## **(2) Steelhead Trout**

Commercial fishing for steelhead has been prohibited in California since the mid-1920's, and the resource is now managed exclusively as a sport species. Most steelhead are caught in rivers rather than offshore. The three most important steelhead rivers are the Klamath and Eel Rivers in northern California, and the Sacramento River which empties into San Francisco Bay in central California. In Washington and Oregon steelhead are currently managed exclusively for recreational and tribal Indian fisheries.

Most steelhead are caught in rivers rather than in marine waters, although there are a few areas off the outer coast of Washington and in Puget Sound where fish are consistently taken. The majority of fish caught upstream are taken by recreational fishermen, while most fish caught near the river mouths are taken by treaty Indians. As a result of a Federal Court Ruling (i.e., the Boldt decision), the steelhead catch in Washington State is presently allocated on a 50:50 basis between treaty Indians and non-treaty recreational fishermen. During 1983-84, for example, approximately 105,000 steelhead (both winter and summer run fish combined) were taken by recreational fishermen, while approximately 80,000 steelhead were taken by treaty Indians.

Over the years 1973-84, a period during which the Boldt decision was in force, the Washington State-wide sport catch for winter- and summer-run steelhead, ranged between approximately 40,000-110,000 fish, and 15,000-60,000 fish, respectively. Based on the 50:50 allocation system resulting from the Boldt decision, it is likely that treaty Indians harvested roughly equal numbers of fish as well.

## **(3) Pacific Whiting**

The annual catch of Pacific whiting from foreign, joint-venture (JV) and domestic fisheries in U.S. waters offshore California, Oregon and Washington averaged approximately 125,000 mt between 1966-1986 (PFMC, 1987). Annual catches were highest, and almost exclusively the result of foreign fishing effort, from 1966 until 1977. Since 1980 the annual catch of whiting has generally decreased, with most of the catch taken by JV or foreign fishing effort. The annual catch quota and the Acceptable Biological Catch (ABC) for whiting in U.S. waters offshore California, Oregon and Washington have generally been increased since 1977, although the actual catch levels have yet to exceed these recommended limits. The ABC was increased from 206,000 mt in 1987 to 325,000 mt in 1988.

## **3. Anadromous Fish - Freshwater Habitat**

The freshwater spawning and rearing grounds and riverine migration routes used by anadromous salmonids such as Pacific salmon and steelhead trout are especially critical



portions of their habitat since the productivity of individual stocks is directly related to the amount and quality of this habitat. In southeastern Alaska, the Tongass National Forest supplies timber for mills at Ketchikan and Sitka and lesser volumes for smaller logging mills at several other locales. Some wood also is used for fuel and local construction. Logging can affect salmon streams and nearshore marine habitat through:

- a) Siltation that reduces gravel permeability in streams with consequent loss of salmon eggs and pre-emergent fry. This sometimes results from illegally operating logging equipment in streambeds or across streams.
- b) Stream blockage as a result of buffer strip blow downs following cutting.
- c) Water warming from loss of shade after cutting, with possible adverse effect on adult spawners and rearing fry.

Over 200 watersheds in the southeastern Alaska Tongass National Forest have been affected to some degree (Netboy, 1990). A number of studies have been conducted by the Alaska Department of Fish and Game, the Alaska Department of Environmental Conservation, the U.S. Forest Service, the U.S. Fish and Wildlife Service, and the National Marine Fisheries Service.

In part, to prevent damage, to mitigate damages, and to perform the necessary research, the above-listed agencies, in cooperation with the timber industry and the Alaska Department of Natural Resources, have organized an interagency group. This Alaska Working Group on Cooperative Forestry and Fisheries Research, has functioned well; however, considerable fisheries-effects studies remain to be done before some definitive conclusions are reached.

The PFMC (1981) reviewed historical problems with, and the status of, freshwater habitat for anadromous salmon stocks in California, Oregon and Washington. In particular, the PFMC cited the many serious problems associated with hydroelectric dam construction and operation.

For example, construction of hydroelectric projects has flooded or blocked access to productive spawning habitat, while the operation of these facilities has resulted in reduced flows during migration and in spawning areas, increased turbidity and sedimentation of gravel, and temperature modifications. Such changes have completely eliminated many areas from salmon production, and have seriously reduced salmon production potential in other areas.

The PFMC review also cited poor land and water use practices such as logging, road building, water diversions, streambed alterations and pollution as factors responsible for substantially reducing or degrading the critical freshwater habitat. Based on the freshwater habitat review presented by the PFMC (1981) (see Table A-1), substantial historical reductions in critical spawning and rearing habitat have occurred for many salmonid stocks in the California central valley (i.e., the Sacramento and San Joaquin system) and the Columbia River drainage systems. Based on the trend existing at the time of their review (1978) the PFMC (1981) estimated that habitat availability in all major river systems and coastal streams within California, Oregon and Washington would continue to decrease, or at best remain unchanged, over the next 10-20 years. Even with habitat rehabilitation efforts, the PFMC (1981) estimated relatively little improvement in habitat availability would be likely to occur over the next 10-20 years.

Although there are no current estimates of habitat availability, many of the same activities (i.e., hydroelectric plant operation and water diversions) that have resulted in habitat loss or degradation still continue. Efforts to mitigate or rehabilitate degraded freshwater habitat are in progress or planned in some areas (e.g., the Upper Sacramento River), and there is increasing recognition (California Advisory Committee on Salmon and Steelhead Trout, 1988) that

substantial action is required to arrest the long-term trend of habitat loss and degradation, and reduced salmon production.

#### 4. Subsistence Activities

Subsistence hunting and fishing are important from both a cultural aspect and in terms of providing a major source of food for native and rural Alaskans. The following information is summarized from the FEIS (DOI, MMS, 1987) which is hereby incorporated by reference. The species used vary somewhat in different portions of the State and from community to community; however, in general, marine mammals and fish are important in most coastal areas.

Important subsistence resources for those communities bordering the Gulf of Alaska, Cook Inlet, and Prince William Sound include salmon, halibut, other marine fishes, freshwater fish, shellfish, intertidal resources, small marine mammals, waterfowl, and upland game.

Communities along the southern Bering Sea harvest salmon, halibut, shellfish, intertidal organisms and plants, fur seals, hair seals, sea lions, birds and bird eggs, and caribou. Communities bordering the northern Bering Sea utilize salmon and other fishes; shellfish; bearded, ringed, and spotted seals; walrus; bowhead and beluga whales; waterfowl; moose; reindeer; and caribou.

Communities bordering the Chukchi and Beaufort Seas depend heavily upon marine mammals. Resources utilized include bearded, ringed, and spotted seals; walrus; bowhead and beluga whales; polar bear; freshwater and ocean fish; waterfowl; birds and bird eggs; caribou; moose; Dall sheep; berries; and vegetation.

#### 5. Municipal Wastes and Other Onshore Effluent

Historically, the Nation's rivers, estuaries, and coastal waters have received municipal waste discharges since collection and treatment of domestic wastes were initiated. Prior to the 1970's, ocean disposal was largely unregulated, and adverse impacts on human health and the environment were observed.

The major point source discharge of waste materials into nearshore and coastal areas comes from sewage treatment facilities, industrial facilities, and electric generating facilities. These discharges are regulated by the EPA. The effluent from the industrial and sewage treatment facilities may contain, even after treatment, substantial quantities of synthetic organics, heavy metals, suspended solids, oxygen-consuming materials, and nutrients. Sewage effluent may also contain fecal coliform and potentially pathogenic microorganisms. Powerplants cooling waste discharges may be elevated in temperature and have increased chlorine levels.

Contaminants from marine transportation activities enter the sea intentionally as a result of routine operational discharges and unintentionally as a result of accidental spills. With respect to ships that maintain sizeable crews, the pollutants are the large amounts of domestic waste products such as sewage, food waste, plastic debris and trash from human activities on board. For recreational vessels, sewage disposal from marine sanitation devices in highly populated, confined harbors and anchorages is the primary pollution concern.

In contrast to the important progress made during the 1970's in controlling industrial point source discharges and in upgrading municipal sewage treatment facilities, progress with non-point sources is negligible (CEQ, 1980). Non-point source pollution is primarily the result of precipitation falling and moving over and through land and into surface waters. In some cases, non-point source pollution is the result of human practices such as agriculture and irrigation. All land-use activities are potential non-point source of pollution. Such sources are classified as urban and non-urban runoff. Pollution discharges from non-point sources greatly exceed the discharge from point sources.



Municipal wastes and other onshore effluent are discussed in by planning area for the Pacific Region in Section IV.B.7. (page IV.B.7.-8), IV.B.8. (pages IV.B.8.-4), IV.B.9. (page IV.B.9.-7), IV.B.10. (page IV.B.10.-18).

## **6. Coastal Development in California**

California's population is estimated to be 28 million, with a potential 50 percent increase in the State's coastal population (within 50 miles of the coast) between 1980 and 2010. At the turn of the century, it was estimated that California had 381,000 acres of prime coastal wetlands. Within 75 years about two-thirds of this acreage had been lost to a variety of developments along the coast. These disturbances have ranged from large-scale, whole-ecosystem elimination to small-scale, habitat-specific alterations. They include for example, urban development, harbor construction, dredging, dike and levee development, and marina development (Speth 1979; Zedler 1982; Zentner 1988).

This dramatic loss of habitat is not without corresponding loss in plant and animal species. In fact, almost all of the species listed as threatened, endangered, or candidate by USFWS can trace their declines to past over-hunting or habitat loss by coastal development.

## **7. Onshore Oil and Gas Related Activities**

The ANWR is situated in the northeastern part of Alaska. The boundaries of the coastal plains portion of the ANWR facing the Beaufort Sea extend from the Canning River Delta on the west to the Canadian border on the east.

Controversy as to whether or not the coastal plain of ANWR should be open for oil and gas exploration and development led Congress to create Section 1002 of the Alaska National Interest Lands Conservation Act (ANILCA). This section laid out guidelines for the Secretary of the Interior to follow prior to reporting to Congress recommendations for the use of the coastal plain, or 1002 area. The FWS released its final legislative Environmental Impact Statement (FLEIS) on the potential effects of exploration and development on the coastal plain in April 1987 (DOI, FWS, 1987). The FLEIS analysis was based on a 250-kilometer pipeline that would extend from the easternmost development hypothesized in the ANWR to TAPS Pumping Station No. 1.

The conditional, economically recoverable resource in the mean case was estimated at 3.2 billion bbls with a 19.0-percent probability of oil being present. Approximately 5,120 hectares, or 0.8 percent of the 1002 area, would be modified from its initial condition. Approximately 320 to 500 kilometers of all-season gravel roads within several oil fields and about 180 kilometers of road between the Canning River and the marine facilities at Pokok Lagoon are assumed.

The Secretary of the Interior recommended to Congress that the entire Arctic Refuge coastal plain (Alternative A) be made available for oil and gas leasing. Section 1003 of the ANILCA states that "production of oil and gas from the Arctic National Wildlife Refuge is prohibited, and no leasing or other development leading to production of oil and gas from the range shall be undertaken until authorized by an act of Congress." Legislation authorizing leasing of ANWR lands which was introduced in Congress has been postponed as a consequence of the Valdez oil spill. The fate of the legislation is uncertain at this time.

## **8. Existing Federal and State Oil and Gas Activities**

### **a. Alaska State Oil and Gas Activities**

A total of 27 lease sales have been conducted by the Alaska Department of Natural Resources since the institution of the five-year leasing program in 1979. Currently producing offshore leases are located in Cook Inlet and the Beaufort Sea. Most of the oil produced from



Cook Inlet is transported by tanker from Nikiski through lower Cook Inlet and the Gulf of Alaska. Oil produced from the Beaufort Sea is transported via pipeline to the Trans-Alaska Pipeline System.

Sixteen sales are included on the current Five-Year Oil and Gas Leasing Program (1989-1993). Seven of these sales are offshore. All offshore sale areas are located in the Beaufort Sea or Cook Inlet. Two recent sales leased tracts in the Beaufort Sea. In Sale 55, tracts from just west of Kaktovik eastward to the Canadian border were leased, and in Sale 52, tracts were leased in the area of Smith Bay. Exploration activities have not yet occurred on tracts leased in these sales.

**b. Endicott Oil and Gas Activities**

The Endicott Oil and Gas Development and Production Project includes 2 gravel islands that are located approximately 4 kilometers offshore and 24 kilometers east of Prudhoe Bay; a 5-kilometer solid-fill gravel causeway connecting the 2 drilling islands; a 3-kilometer gravel causeway with 213 linear meters of breaching extending from the Sagavanirktok (Sag) River Delta to the inter-island causeway; a 2.5-kilometer gravel-causeway approach through the Sag Delta and a 14-kilometer gravel road through Sag Delta wetlands that connects with the existing Prudhoe Bay road system at Drill Site 9; elevated oil pipelines along the onshore road segments to Trans-Alaskan Pipeline System Pump Station No. 1; and an onshore disposal pit to contain drilling discharges determined to be unsuitable for offshore disposal.

**c. Seal Island**

Seal Island is constructed on a lease obtained by Shell Oil company during the Joint Federal-State Beaufort Sea Lease Sale held in 1979. Recovery of 300 million bbls of oil has been estimated from a discovery announced by Shell in January 1984. Shell would like to start producing about 100,000 bbls per day of oil, possibly by 1992. An oil discovery from Northstar Island, about 4 kilometers northwest of Seal Island, was announced in January 1986. That discovery helped to define the Seal Island reservoir (Alaska Report, Jan. 22, 1986). Amerada Hess drilled one well and spudded a second from Northstar during the 1985-1986 winter drilling season (Van Dyke [State of Alaska, DNR], 1987, pers. commun.).

**d. Niakuk Development Project**

British Petroleum Exploration plans to develop the Niakuk hydrocarbon reservoir in the Alaskan Beaufort Sea. The project is located off Heald Point at the northeast quadrant of Prudhoe Bay. The major components of the project, as originally proposed, involve expanding an existing offshore artificial gravel island located in about 4.50 feet of water, constructing a 1.25-mile long gravel causeway (including a 350-foot breach to mitigate fishery impacts) from shore to the island, and constructing a 1.75-mile gravel road from the point of landfall of the causeway to an existing production pad. The permit request for the gravel causeway was denied by the Army Corp of Engineer's District Engineer, but that decision is now under reconsideration. Other project components would include pipelines paralleling the new and existing gravel construction and possibly production modules on the island. The production island will accommodate 14 wells. Initial oil production would be about 20,000 bbls per day, and the life of the project is estimated at 15 years.

**e. Alaska Federal Oil and Gas Activities**

The following lease sales have occurred within the Alaska OCS Region. Exploration activities have occurred within each of the sale areas except the North Aleutian Basin. Active leases remain within these sale areas and additional exploration activities could be forthcoming.

Lease Sale BF - Beaufort Sea  
Lease Sale 71 - Diapir Field  
Lease Sale 57 - Norton Sound  
Lease Sale 70 - St. George Basin  
Lease Sale 83 - Navarin Basin  
Lease Sale 87 - Diapir Field  
Lease Sale 92 - North Aleutian Basin  
Lease Sale 97 - Beaufort Sea  
Lease Sale 109 - Chukchi Sea

Activities associated with exploration are discussed within Section IV.A of the FEIS. Exploration activities could include exploratory drilling from a jack-up rig, semi-submersible drilling unit, drillship, bottom-founded drilling unit, or artificial island; helicopter support operations; support vessel operations including ice management in the northern sale areas; and high-resolution shallow-hazard seismic surveys.

To date, there have been no proposals for development and production within the Alaska OCS Region. Should oil and/or gas be discovered in commercially producible quantities on leases within one or more of the aforementioned sale areas, development and production activities as described in Section IV.A. of the FEIS could occur. Transportation of produced product may occur by pipeline or tanker and could transit several planning areas.

#### **f. Northern and Central California Federal Oil and Gas Activities**

Section IV.B.8 (page IV.B.8-4) and IV.B.9 (page IV.B.9-4 to IV.B.9-7) in the FEIS for the Proposed Program discusses the existing oil and gas activities and infrastructure within the Northern and Central California Planning Areas, respectively. The only Federal lease sale (Northern and Central California, P-1) in the Northern and Central California Planning Area occurred in May 1963.

From July 1964 when Exxon drilled the first well off the coast of Humboldt county through November 1966, a total of seven exploratory wells were drilled in the Northern California Planning Area. Three wells were drilled by Shell in 1965-1966 in the Point Arena Basin following the 1963 OCS lease sale. In the offshore Eel River Basin, four exploratory wells were drilled between 1964 and 1965. There has been no development or production in the area.

Between September 1963 and September 1967, Shell Oil Company drilled twelve exploratory wells in the Central California Planning Area. Ten wells were drilled in the Bodega Basin, beginning in 1963, and two wells were drilled in the Ano Nuevo Basin, beginning in 1967, on leases issued in the 1963 OCS lease sale. All oil and gas leases have now expired in the area.

#### **g. Southern California Federal Oil and Gas Activities**

Section IV.B.10 (pages IV.B.10-9 to IV.B.10-16) in the FEIS for the Proposed Program discusses the existing oil and gas activities and infrastructure within the Southern California Planning Area. In the Southern California Planning Area, eight OCS lease sales and one reoffering sale have been held.

While oil production commenced off southern California in 1896 with the development of the Summerland Field in State waters, exploration began in Federal waters in the Santa Maria Basin in 1964 with the drilling of exploratory wells following the first Pacific oil and gas lease sale in May 1963. Chevron Oil Corporation drilled the first well in Federal waters in September 1964, off the coast of San Luis Obispo County. Twelve fields are located in the onshore portion of the basin, with one field on production in the offshore portion. One COST well was completed in 1978. As of September 1988, 296 exploratory wells had been drilled in the Southern California Planning Area.



Following the discovery of the Dos Cuadros oil field by Phillips Petroleum Company in 1967, exploration activities in the Pacific OCS focused on the Southern California Planning Area. A record number of 38 exploratory wells were drilled in the Pacific OCS in 1968. This exploratory activity in 1968 led to the discovery of the Hondo, Government Point, Pescado, and Secate Fields in the Santa Ynez Unit and increased industry's interest in the oil and gas potential of the Pacific OCS Region.

Exploration activities increased from 1974 through 1977, as industry further defined the oil and gas potential of the Southern California Planning Area. After a slight decline, exploration began a steady increase in the early 1980's as lease sales offered new acreage for offshore operators to explore. Since that time, the pace of exploratory drilling in the Pacific OCS has declined, as offshore operators focused their attention on development and production operations.

Twenty-four offshore fields are located in five major areas of the Southern California Planning Area; i.e., Point Arguello/Gaviota, Santa Ynez/Las Flores Canyon, Point Pedernales/Lompoc, San Miguel/South Nipomo Mesa, and Santa Clara/Ventura. Fourteen fields capable of commercial production have been discovered in the Santa Barbara Channel in Federal waters since the advent of drilling there in 1967. Further fields are currently on production.

Two oil fields have been discovered offshore San Pedro in the inner banks area of the southern California borderlands. Of the total wells in the planning area only nine exploratory wells, commencing in 1976, have been drilled in the outer banks area. As of September 1988, 661 development wells have been drilled from 21 permanent production platforms. The cumulative production from this area, from its beginning in 1968 through 1987 has been approximately 403 million bbls of oil and slightly less than 284 billion cubic feet of natural gas. Annual production is about 33 million bbls of oil and 45 billion cubic feet of gas.

Development and production plans have been approved or are under consideration for four additional field projects involving six new platforms. In the Santa Ynez Unit, 3 additional platforms are proposed for installation; i.e., Harmony/60 well slots/in 1992, Heritage/60 well slots/in 1992, and Heather/28 well slots/in 1995. Platform Julius was proposed to be installed in 1988 with 70 well slots in the San Miguel Field. A San Luis Obispo voter initiative disapproved the onshore processing and transportation facilities of Platform Julius. Platform Independence is proposed to be installed in 1992 with 60 well slots in the Point Pedernales Field but may not be needed for development. Platform Hacienda is under consideration for the Rocky Point Field but no official development and production plan has been received. Shell Western Exploration and Production Inc. is considering a relocation of planned onshore facilities to Santa Barbara County.

#### **h. Southern California State Oil and Gas Activities**

There are 51 active leases on State offshore lands covering 161,000 acres. Twenty-nine are off Santa Barbara County, 10 are off Orange County, and 12 are off Ventura County. Nine platforms and seven production islands are presently operating on these leases. Four of the manmade islands are inside the Los Angeles/Long Beach Harbor Breakwater. The last State offshore lease sale was held in 1969. A description of the offshore field within the 3-mile limit of the State's jurisdiction is contained in Section IV.B.10 (pages IV.B.10.-6 to IV.B.10.-8). The following is an update of several of the development projects in State waters.

##### **(1) Shell Hercules Project**

Shell proposes to install one platform and subsea pipelines to shore off Molino (28 miles west of Santa Barbara). The project was withdrawn from State Lands Commission review by Shell after the joint EIS/EIR was prepared.



## **(2) Arco Coal Oil Point Project**

Arco proposed to install three platforms (Heron, Hawk, and Haven) and subsea pipelines to shore offshore Coal Oil Point (10 miles west of Santa Barbara). The proposal includes the installation of oil and gas processing facilities, and onshore pipelines to treatment facilities. The State Lands Commission did not approve the Arco Coal Oil Point Project. Approval of the project is currently under litigation.

## **(3) Union Cojo Project**

Union proposes the installation of a platform (Haley) and subsea pipeline offshore Point Conception. The proposal includes onshore pipelines from the platform to Union's Lompoc oil dehydration facility. A development plan has been submitted to State and local agencies.

### **i. Canadian Beaufort Sea Oil and Gas Activities**

The following information concerning Canadian Beaufort Sea oil and gas activities is summarized from Campbell (1989). Eighty wells have been drilled to date in the Canadian Beaufort Sea. There have been 26 significant discoveries encompassing an estimated 1.5 billion bbls of oil and 4.5 trillion cubic feet of natural gas. The giant Amauligak oil and gas field will likely be the lead offshore oil development project, although plans are on hold at present. Current transportation concepts suggest that oil from Amauligak will be shipped by pipeline from the production islands to shore at Richards Island and then down the Mackenzie Valley to southern markets. There are currently 9 offshore exploration licenses in good standing. These licenses are due to expire in 1990 or 1991.

## **9. Transportation of Oil and Gas**

### **a. Cook Inlet Tankering**

An increase in Cook Inlet-produced oil may be shipped to markets in the Far East if allowed by Congress. Laws currently restrict the export of oil produced from Federal and State leases in Cook Inlet to 3,000 bbls per day (about two tankers per year), the current level of export. However, efforts are under way by Alaska's congressional delegation to end these restrictions. If the restrictions are removed, it is estimated that 36 MMbbl of oil may be transported by tankers over the life of the Cook Inlet Field. This could amount to an average of about 14 tanker trips per year. It is believed that the tankers would travel the great circle route from Cook Inlet to Pacific Rim markets, which would result in tankers traveling through Unimak Pass and then westward just north of the Aleutian Islands. Alaska OCS Planning Areas likely to be affected would include Gulf of Alaska/Cook Inlet, Kodiak, Shumagin, and St. George Basin.

### **b. Trans-Alaskan Pipeline System**

The majority of the oil produced in Alaska is transported via the Trans-Alaskan Pipeline System (TAPS). The TAPS began transporting crude oil from the Alaska North Slope to Valdez on June 10, 1977. The TAPS is a 48-inch diameter pipeline designed to have a potential capacity of 2.0 million bbls per day, although 1.7 million bbls per day has been set as the maximum efficient rate by the Alaska Oil and Gas Conservation Commission.

The terminal at Valdez is able to handle four tankers at one time and has an average turnaround time of 24 hours. The TAPS is presently delivering crude oil from Prudhoe Bay which initially has an estimated 9.6 billion bbls of recoverable oil reserves and from Kuparuk which has an estimated 1.6 billion bbls of recoverable oil reserves.

A total of 2.0 million barrels per day is transported by tankers out of Alaska. Of this, about 680 thousand barrels per day are transported by tankers into ports within California.

### **c. Trans-Alaska Gas System**

The Yukon Pacific Corporation proposes to construct the Trans-Alaska Gas System (TAGS). This system would transport natural gas from Alaska's North Slope via a 36-inch outside diameter pipeline to a tidewater facility at Anderson Bay, Port Valdez, Alaska. The proposed TAGS closely parallels the existing TAPS oil pipeline. Up to 2.3 billion cubic feet of conditioned natural gas per day would be moved through TAGS. At Valdez, the natural gas would be converted to liquefied natural gas for export by tanker to markets in the Asian Pacific Rim.

## **10. Nonenergy Minerals**

### **a. Red Dog Mine**

The Red Dog Mine is located 87 kilometers from the Chukchi Seacoast and 145 kilometers north of Kotzebue. The seaport for the mine is located approximately 27 kilometers southeast of Kivalina. Production is scheduled to begin in 1990 with 1.1 million metric tons of ore. Full production at a rate of 1.9 million metric tons per year is expected to begin in 1993 and continue into the future. Variations in production after 1992 will reflect different percentages of lead, zinc, and other mineral concentrates in the ore that is mined. At full production, 5.5 thousand metric tons of ore per day would be mined.

The port facility consists of a dock and causeway 40 meters wide and 60 meters long that extends into a water depth of 4 meters. Ore will be loaded from a dock that consists of 3 cells 23 meters in diameter that are filled and connected with a covered conveyer system and walkway. This dock will be about 210 meters long and extend to a water depth of 5.5 meters. Ore shipping will occur only during open-water periods (approximately 90 to 100 days/year). Ore will be loaded onto lightering vessels which will make four trips per day to ore carriers which will be loaded offshore. Ore carriers will make about 15 trips per year to smelters on the Pacific Coast of North America, the Far East, and Europe. The life of the field is estimated at 50 years. The port facility is located adjacent to the Hope Basin Planning Area.

### **b. Federal Offshore Mining Program - Norton Sound Lease Sale**

The following information regarding the OCS Mining Program Norton Sound Lease Sale, and offshore mining in State waters was derived from the OCS Mining Program Norton Sound Lease Sale DEIS (DOI, MMS, 1988) which is hereby summarized and incorporated by reference. The proposed action consists of 40 blocks to be offered for lease in July 1989. The total areal extent of the proposed Norton Sound Lease Sale is about 72,148 hectares (approximately 178,282 acres). The blocks that comprise the proposed action are located about 5 to 22 kilometers offshore in water depths that range from about 20 to 30 meters. The MMS has estimated that placer deposits of gold in the proposed lease-sale area for a mean case could be 530,000 troy ounces. It is projected under the mean case that one dredge would be utilized for mining. About 60 acres per year would be dredged for a period of 14 years, with total dredging to include about 800 acres.

### **c. State Offshore Mining Program**

Two areas along the northern shore of Norton Sound have valid mining leases—the area adjacent to the city of Nome and a small area off the coast near Bluff, about 85 kilometers east of Nome. Permits have been applied for along much of the coast within 50 kilometers to the east and west of Nome. These permits have been pending for several years. As a result of the success of the current mining operation off the coast of Nome, the State may take action on these permits in the near future.

Western Gold Exploration and Mining Co., Limited Partnership (WestGold) is mining for gold on 8,802 hectares (21,750 acres) of offshore leases that extend from about 1.6 kilometers east



of Nome to about 16 kilometers west of Nome. The leases extend approximately 4 kilometers offshore. WestGold uses the *Bima*, the largest bucketline offshore-mining vessel currently active. Minimum digging depth is 9 meters; maximum digging depth is 45 meters.

The dredge footprint for the 1987 season covered an area of approximately 22 hectares (53.83 acres). The current offshore-mining operation uses no beneficiation chemicals and yet appears to be exceeding EPA National Pollutant Discharge Elimination System (NPDES) limitations for two trace metals (mercury and nickel), and turbidity in the water column. Data from compliance monitoring by industry indicate that turbidity standards frequently are exceeded at the edge of the 500-meter mixing zone.

The length of the operating season is anticipated to be 160 days long. It is assumed that WestGold will continue to use the *Bima* on the leases off the coast of Nome and that a shallow-water dredge will be added by 1990.

Pending the results from the smaller shallow-water dredge, it is assumed that lessees holding the leases off the coast of Bluff also would begin to operate a smaller shallow-water dredge—the lease is only 518 hectares (1,280 acres) and water depth is less than 20 meters. During each drilling season, the two smaller dredges (the one operated by WestGold and the other by the lessees off Bluff) would dredge less than the 25 hectares (60 acres) assumed for the *Bima*. The use of mercury during these operations is uncertain. The *Bima* has successfully mined gold without using mercury. However, the State has no categorical exclusion on the use of mercury offshore. Previous operations off the coast near Bluff have been unsuccessful.

#### **D. Cumulative Impacts on Migratory Species**

##### **1. Marine Mammals**

##### **a. Threatened or Endangered Cetaceans**

##### **(1) Bowhead Whale**

The western arctic stock of bowhead whales is currently estimated to number about 7,800 individuals (Zeh, Reilly, and Sonntag, 1988). This estimate is considerably larger than the estimated number of bowhead whales that remained at the close of the commercial whaling period (greater than or equal to 1,000 animals) at the turn of the century. There have been no clear trends in terms of population growth in recent years. Population estimates have risen, although the major increases in these estimates are more likely due to better censusing techniques than to a rapidly increasing population. The current estimated population may be about 40 percent of the historic population level prior to commercial exploitation (based upon numbers cited by Braham (1984b)).

Some effects on bowhead whales may occur from activities conducted on previously held State and Federal offshore lease sales. Generally, bowhead whales remain far enough offshore to be found mainly in Federal waters; however, in some areas (e.g., the Beaufort Sea southeast and north of Kaktovik and near Point Barrow) the whales do come close enough inshore to be present in State waters. If exploration, development and production activities occur on leases from State Sales 52 and 55 and future State sales scheduled for the Beaufort (see Section IV.C.), noise impacts on bowhead whales may occur as described in Section IV.B.5.a. These impacts could result from avoidance of vessels, seismic surveys, dredging, drilling, drillships, and production operations that occur within several kilometers of the whales. Bowheads may respond briefly by diving in response to low-flying helicopters. However, it is unlikely that there would be any major changes in the overall fall migration route.



Should an oil spill occur and contact bowhead whales impacts could include those discussed in Section IV.B.4.d.1, including inhalation of hydrocarbon vapors, a loss of prey organisms, ingestion of spilled oil or oil-contaminated prey, baleen fouling with a reduction in feeding efficiency for up to a couple of days, and skin and/or sensory-organ damage.

Bowhead whales could experience impacts similar to those described above from exploratory operations which result from past Federal OCS oil and gas lease sales. It is likely that in future years some additional exploration will take place on previously-leased Federal tracts in the Beaufort Sea. If past experience is used to predict future trends, then for about the next 5 years, fall-migrating bowheads may be exposed to an average of one to two exploratory operations per year. Bowheads that approach these sites would be expected to respond as previously described, making minor deflections in their individual swimming paths within the migration corridor to avoid drillsites. Noise from drilling operations is expected to ensonify only a portion of the bowhead-migration corridor and affect a minor portion of the bowhead population. The width and location of the overall fall bowhead whale migration corridor is expected to remain virtually the same.

It is expected that there would be very few impacts on bowhead whales during their fall migration through the Chukchi and northern Bering Seas, and on their wintering grounds in the Bering Sea. Currently, there are no plans for future oil and gas exploration activities in the Navarin Basin on Sale 83 leases. Based upon past operations, exploratory drilling would take place most likely during the open-water season when bowheads are not present in the area.

On their summer feeding grounds in the Canadian Beaufort Sea, the whales may be subject to some noise from offshore oil and gas exploration, development and production. Industry interest, to date, has centered around the Mackenzie Delta and offshore of the Tuktoyaktuk Peninsula (see Section IV.C.), which comprise a portion of the bowhead's summer range. Possible disturbance to bowhead whales from helicopters, vessels, seismic surveys, and drilling would be as previously described. Bowhead whales would be exposed to the risk of oil spills from exploration, development and production, and transportation of oil from the Canadian Beaufort Sea. Oil-spill impacts on the bowhead whales would be as previously described.

A potentially significant non-OCS impacting agent on the bowhead whale population is the annual subsistence hunt by Alaska natives. Bowheads are hunted in the northern Bering Sea and in the Chukchi Sea on their spring migration and in the Beaufort Sea on their fall migration. A quota of 44 strikes or 41 whales landed has been authorized by the International Whaling Commission for 1989. This level of harvest was allowed under the supposition that it would still allow for a slow growth in the bowhead population. It was assumed that in future years the bowhead whale population will continue to be monitored, and that harvest quotas will be set in order to maintain the bowhead population.

Whenever native hunting vessels are nearby, whales are likely to try to avoid them; however, once the whales migrate out of the Beaufort Sea, there would probably be few whales interacting with hunters during the fall season, and none during the winter. As the bowheads migrate northward through the northern Bering, Chukchi, and Alaskan Beaufort Seas during the spring, they are subject to being killed by subsistence whalers. A few whales also may be approached by natives hunting seals and walrus. These whales would also attempt to avoid such vessels.

Noise impacts could be expected from the oil and gas activities associated with the current and future 5-year programs within the bowhead whale's U.S. range. Noise-producing activities that could interact with fall migrating bowheads would include aircraft traffic, icebreaker or other vessel traffic, geophysical-seismic surveys, artificial-island construction, drilling operations, pipeline construction, and production. Impacts of these activities on migrating bowheads, for

the most part, have been described previously and bowhead responses could be termed localized avoidance.

Bowheads observed in the presence of drilling operations on their summering grounds in the Canadian Beaufort Sea and during their fall migration through the Alaskan Beaufort Sea exhibited little behavioral responses to these exploratory activities (Richardson, Wells, and Wursig, 1985; Davis, 1987). There was evidence that bowheads avoided close approach (within 10 km) to a drilling operation in the Alaskan Beaufort Sea; however, there was no evidence that the drilling operation acted as a barrier to migration, that migrating whales were significantly delayed while diverting around the drilling operation, or that the time and energy taken to divert around the drilling operation was in any way significant to the well-being or annual energy budget of individual bowheads (Davis, 1987). Bowheads would attempt to avoid any vessel which approaches within several kilometers. Bowheads respond to dredge noise and drilling noise similarly.

Stationary sources of offshore noise seem less disruptive to bowhead whales than moving sound sources. Consequently, pipeline construction and production platform noise are probably less bothersome to bowheads than vessel operations. Since there are no production platforms located offshore within the range of the bowhead whale, bowhead behavior has not been observed in the presence of platform noise. A study evaluating the impacts of production noise on bowhead whales has been funded by MMS and is currently underway. Gray whales have demonstrated that they respond to noise sources in a generally similar fashion as bowheads. If migrating bowheads respond to production noise in the same manner as migrating gray whales off the California coast (Malme et al., 1984), their response to production-platform noise would be much less than their response to drillship noise. As a result, it is expected that bowheads would respond to noise from production platforms by slightly altering their migration speed and swimming direction to avoid approaching these platforms closely (perhaps within a few kilometers).

It appears that exploratory activities would continue within the range of the bowhead whale for at least the next 10 to 15 years, and production would continue for about 40 years. Bowheads may encounter from one to several exploratory operations or production platforms along their fall migration route through the Beaufort Sea, Chukchi Sea, and Hope Basin Planning Areas. Bowheads would likely make small changes in swimming speed and direction to avoid closely approaching these operations.

Bowhead whales on their fall migration in the vicinities of Point Barrow and Point Belcher may be exposed to some under water noise associated with OCS oil and gas activities. Support traffic (helicopters and vessels) would likely travel between Barrow and any exploration units or production platforms in the planning area. Bowheads would dive quickly if helicopters passed low overhead, and they would seek to avoid close approach by vessels. Most activities would occur during the approximate 10-year period of exploration and development. Once the production platforms and pipelines are in place, the whales would have relatively few noise sources to avoid.

In the Norton and Navarin Basin Planning Areas, if future exploration is confined to the open-water period as it has been in the past, there would be no OCS impacts on bowhead whales since bowheads are not present during the open-water period. During production and if exploration does occur during the fall-spring period when bowheads may be present, impacts on bowhead whales would entail local avoidance, as described previously. Impacts to bowhead whales on their spring migration through the Norton and Navarin Basins would be similar to those previously described for the fall migration.



Concerns have been raised in regard to the impacts of noise from OCS operations being present in the spring lead system and the potential for this noise to delay or block the bowhead spring migration. Principal sources of OCS-related noise during the spring could include bottom-founded drilling units and production platforms. To date, there have been no drilling or production operations in the vicinity of the spring lead system during the bowhead migration. However, based on noise conditions in the lead system and whale behavior in general in the presence of exploration units and production platforms, it can be projected how bowheads might respond to exploration and production noise in or near the lead system. The following generic information is summarized from pages IV-B-80 through IV-B-82 of the FEIS for the Chukchi Sea Oil and Gas Lease Sale 109 (DOI, MMS, 1987b) which is hereby incorporated by reference. One factor to consider is that exploration units and production platforms are stationary, whereas the lead system is not. An exploratory platform present within or near a lead one day may be well outside the lead the next day; therefore, whether it is an obstacle would vary.

High ambient noise levels have been measured at the boundary between open water and pack ice; consequently, ambient noise could be high in the area of the spring lead. If this is the case, ambient noise may mask distant industry noise making it less audible and probably less disturbing to the bowheads. Gray whales, which appear to respond to noise at levels fairly similar to bowheads, show little avoidance of production- or drilling-platform noise. Experimental evidence using playback noise indicated that the point at which 50 percent of migrating gray whales would avoid platform noise was 56 meters for production platforms and 40 meters for drilling platforms (Malme et al., 1984). Sightings of migrating gray whales immediately adjacent to production platforms off the California coast seem to support this experimental evidence. Consequently, if bowheads respond to platforms as do gray whales, there should be little avoidance of platforms or drilling units located in or near the spring lead system, and adverse impacts on the migration should be minimal.

Cumulative impacts on bowhead whales, while on their summering range in the Canadian Beaufort Sea, are expected to include local avoidance of offshore oil and gas activities in the Mackenzie Delta. Impacts of these activities on bowhead whales in Canadian waters are expected to be similar to those impacts previously described for bowheads during their fall migration through the Alaskan Beaufort Sea.

The total number of oil spills greater than or equal to 1,000 bbls assumed to occur during the next 35- to 40-years in the planning areas through which bowhead whales migrate are as follows: Beaufort Sea, 3; Chukchi Sea, 7; Norton Basin, 2; Navarin Basin, 13 (see Table IV.B.4-2).

In the event bowhead whales contact an oil spill during the fall migration through the Beaufort and Chukchi Seas, impacts as previously described in Section IV.B.4.d.1 could occur. These may include inhalation of hydrocarbon vapors, irritation of eyes and sensitive skin tissue, temporary fouling of baleen, ingestion of some oil or oil-contaminated prey, and a possible localized reduction in food resources. These impacts would generally be minor and transient unless whales were confined to an area of freshly spilled oil. The fall bowhead migration occurs over a 6-to 8-week period. Consequently, it is likely that only a small percentage of the bowhead population would be exposed to fresh or lightly weathered oil, and few whales, if any, would be expected to be killed or seriously injured by an oil spill.

After bowheads move westward past Point Barrow, they tend to fan out and cross the Chukchi Sea in a broad front. Consequently, this dispersion also reduces the risk of many whales contacting a fresh oil spill. Of course, if the oil spill occurred over a prolonged period of time, more individuals could be contacted. The probability of an oil spill adversely affecting



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fall-migrating bowheads in the Hope Basin is very low, as most bowheads appear to migrate south within Soviet waters along the coast of the Chukchi Peninsula.

Bowheads would probably be migrating through the Norton Basin Planning Area at the time of rapid ice formation. If oil is spilled during the fall bowhead migration through the area, impacts on bowheads may be similar to those which might occur if oil were spilled into a lead system. A discussion of such impacts is contained on pages IV-B-78 through IV-B-82 of the Chukchi Sea Oil and Gas Lease Sale 109 FEIS (DOI, MMS, 1987b).

The presence of ice could restrict the spread of the oil. Agitation of ice particles in combination with oil could initially increase oil dispersion into the water column; however, it would also result in a more rapid formation of a water-in-oil emulsification. Grease ice (newly formed ice) and spilled oil would be blown downwind and would accumulate in a band along the downwind edge of open leads or ice floes. When the lead closes or ice floes are blown together, the accumulated grease ice and oil would be pushed onto the adjacent ice. It is unlikely that oil would completely cover the surface of the water except in cracks and small pools sheltered from the wind.

Harmful concentrations of toxic vapors would be carried away from any leads by the wind, and most volatile compounds would be lost within 24 to 48 hours of weathering at the surface. Oil spilled under winter ice would pool and freeze to the underside of the ice. First-year arctic ice—the most prevalent type in the area—can store up to 150,000 to 300,000 bbls of oil per square kilometer in under-ice relief. Consequently, oil spilled in heavy ice cover would not spread appreciably under the ice before being frozen into the ice. The spilled oil would then move as part of the pack ice. The oil would either melt out at the southern ice edge as the pack retreated or would migrate through brine channels and pool on top of the ice as spring melting begins.

Spilled oil might contact migrating whales as they surface to breathe. Contact with oil would be brief unless the whales stopped to feed in the area. Impacts would generally be similar to those previously described including baleen fouling, inhalation of toxic vapors, ingestion of oil or oil-contaminated prey, and irritation of skin or sensitive tissues. Bowheads may migrate through an oil-spill area without actually contacting oil since, as mentioned earlier, the oil would accumulate along the downwind edge of any open-water areas. On occasion, bowheads have been observed continually returning to the same small area of open water, presumably because there was not more readily available open water where they could surface. If a substantial quantity of fresh crude oil or an aromatic refined petroleum product were spilled into such an area of open water, it is possible that the animals trapped there could die or suffer pulmonary distress from the inhalation of toxic vapors. However, this is expected to be a very rare case that would only affect a low number of whales.

Bowhead whales would be present in the Navarin Basin Planning Area during the winter months so that any spill occurring when bowheads are present would likely be under pack-ice or broken-ice conditions. Oil-spill impacts on bowhead whales in the Navarin Basin would be as previously discussed for the Norton Basin. Areal extent of oil spills would be limited by the ice. Bowheads appear to be widely scattered along the ice front on their wintering grounds in the Navarin Basin. As a result of this dispersion, only a few whales would likely be exposed to a fresh spill and could be killed or seriously injured by oil spills.

Impacts of oil spills on spring-migrating bowheads through the Norton Basin, Hope Basin, Chukchi Sea, and Beaufort Sea Planning Areas would be as described under the fall migration through the Norton Basin. Concerns have been voiced regarding oil spill impacts on spring-migrating bowheads since the migration appears to be closely linked to the narrow lead system which develops along the Alaskan coast of the Chukchi Sea. As was previously

mentioned, if bowheads were confined to a small open-water pond within the lead system and prevented from migrating further due to heavy ice conditions, and if oil were spilled into this pond, it is possible that the whales trapped there could die or suffer pulmonary distress from the inhalation of toxic vapors. However, this would rarely occur and would affect a low number of individuals.

Should a large oil spill occur which covers a substantial stretch of a major spring lead used by migrating bowheads, a majority of the spring bowhead migration might be delayed or temporarily blocked. Bowheads would probably not migrate through the pack-ice zone to avoid an oil spill blocking a lead unless the pack-ice zone had sufficient cracks or small ponds that the bowheads could use for respiration. If a large oil spill were to occur and inundate a section of the major spring lead, it could affect a substantial portion of the bowhead population; but unless the oil spill were prolonged, its impacts would likely be short-lived. Within several hours to several days after cessation of the oil spill, the oil should have accumulated along the downwind or downcurrent edge of the lead and should no longer pose an impediment to the migration. Such a short-term delay in the migration should not result in significant impacts on the population, since there is considerable natural variability in the migration due to ice conditions. A substantial number of bowheads could contact oil since individuals, driven by the migratory urge, might attempt to find a safe passage through the oil. Some of these individuals might succumb to toxic vapors if the oil spill were very fresh. On the other hand, it has been shown that bowheads are quite adept at migrating beneath thin ice (George et al., 1989); therefore, it could be that an oil-contaminated lead may not be a significant obstacle to the bowhead migration as they may migrate under the ice around the area of contamination.

Multiple oil spills occurring within the range of the bowhead whale within a single year do not appear to result in impacts significantly greater than those that would occur if the same number of oil spills were spaced over several years. Bowhead whales are well dispersed on their summering grounds and also appear to be scattered on their wintering grounds. Consequently, the most critical time of year and area in terms of an oil spill occurring would likely be along the spring lead system where many whales pass within a short period of time and their ability to avoid an oil spill may be limited by heavy ice cover.

In addition, calving appears to occur from March to July, about the time of the northward migration, so a number of young calves may be present and more susceptible to adverse impacts from oil spills. Multiple oil spills occurring along the spring lead system could result in oil contacting many individuals; however, it is unlikely that serious impacts would result unless individual whales were compelled to remain within an area into which fresh or relatively fresh oil was spilled. The chances of this occurring are very low, and the chances of such an event harming a large number of individuals appear to be virtually nil.

The overall cumulative impacts to bowhead whales combine the impacts from State oil and gas lease sales, previous Federal lease sales, Canadian offshore oil and gas activities, native subsistence hunting, and the 5-year programs. It should be noted again that except for limited areas bowheads do not migrate through areas offered in the State lease sales, and impacts are expected to be low. Past Federal lease sales have not resulted in any oil or gas production, and future planned activities on these leases appear limited at this time. Consequently, impacts appear to be low.

Activities in the Canadian Beaufort Sea have resulted in a number of oil and gas discoveries, and production could be forthcoming. However, the area of oil and gas interest occupies a small portion of the bowhead whale summer range, and any impacts of this development are likely to be low.



Subsistence whaling will continue to account for some harvest of bowhead whales. However, the bowhead population will likely be monitored in the future, and harvest quotas will be set to avoid depleting the population.

The current and future 5-year programs may result in exploration and production activities that will produce underwater noise. Behavioral studies have suggested that bowheads habituate to noise from distant ongoing drilling, dredging, or seismic operations (Richardson et al., 1985a, b), but there is still some apparent localized avoidance (Davis, 1987). Richardson et al. (1985) reports there is little evidence to indicate whether or not industrial activity in an area for a number of years would adversely impact bowhead use of that area, and there has been no documented evidence that noise from OCS operations would serve as a barrier to migration.

**CONCLUSION:** It is expected that overall cumulative impacts to the bowhead whale population would be low.

## (2) Gray Whale

The gray whale is by far the most abundant of the endangered cetaceans in the Alaska and Pacific Regions. In 1937, the International Agreement for the Regulation of Whaling gave protection to the gray whale from hunting by a few nations; in 1946, Japan and U.S.S.R. joined 15 other nations in signing the International Convention for the Regulation of Whaling, which restricted the harvesting of gray whales. Since 1951, all nations operating in the North Pacific have agreed to the provisions which protect gray whales (Reeves, 1984).

Population estimates of gray whales vary since some censuses have been taken from shore and some have been taken from aerial surveys. But by all estimates, it appears that the current population of gray whales is between 13,450 and 19,000 animals (Braham, 1984). This level is believed to be at or above its pre-commercial whaling population size. The population has increased steadily (at an estimated 2.5 percent rate from 1967 to 1980) since it was given protection from overharvesting in the 1940's (Reilly, 1983).

Currently, the major causes of impacts affecting this species are noises from vessels and OCS activities, entanglement in gillnets, and exposure to oil spills. The potential impacts caused by these events exist throughout the gray whale's range (see Section III.A.1.b. for migration range of the gray whales).

Gray whales have been found to respond to noise from vessels of any size. A reaction was generally recorded when the boat was within 4 km (2.5 mi); whereas avoidance was recorded when a boat approached within 2 km (1 mi) of a gray whale. Gray whales are especially sensitive to vessel traffic in the calving lagoons (Gard, 1974). Currently, three of the five major calving lagoons are designated as National Refuges by the Mexican Government, and vessel traffic is restricted. It is expected that these lagoons would continue to be protected in the future.

Wolman and Rice (1979) hypothesize that increased vessel traffic off southern California might be causing greater numbers of whales to migrate further offshore. However, they also pointed out that little quantitative data exist to support this hypothesis, and earlier investigators may have simply overlooked the importance of offshore routes. Therefore, there is no evidence that increased vessel traffic has resulted in any adverse impacts, including population decline.

In general, the impacts of noise from existing oil and gas activities on gray whales have been analyzed in detail in the FEIS (Section IV.A., page IV.A.-84) and seismic noise on gray whales in DOI, MMS (1983). These studies indicate gray whales generally tolerate noises in ranges of 6-8 km (3.7-5 mi) from the source, but show avoidance behaviors when the source is less than 5 km (3 mi) away.



Noise caused by geophysical surveys is potentially the most disruptive of OCS-related noises because it is not the chronic, routine noise from a stationary source to which wildlife generally habituate. Miles (1984) reported that 430,000 miles of survey lines were conducted off the Pacific Coast between 1964-1983 with the number of miles of line increasing steadily per year from 2,000 line-miles in 1964 to 64,000 line-miles in 1983. Approximately half of these surveys were conducted during the whale migration; yet, the number of gray whales has steadily increased since 1937. Over the last decade and a half, during which geophysical survey activities have increased by 5 percent, the whale population has continued to grow at a rate of about 2.5 percent/year. Therefore, it appears that, at least at the current level, geophysical operations have had no overall harmful impact on the population.

An unknown number of whales drown after becoming entangled in gillnets each year. Gillnetting was the known cause of death for 1 of 8 gray whales which were stranded in California in 1983, and for 4 of 21 which were stranded in 1984 (Seagers et al., 1986). Mortality caused by gillnetting entanglement is expected to continue, but may not increase. This mortality is expected to result in changes in the abundance of the population for less than 1 to 3 years, and therefore, by definition is considered a low impact.

Oil spill impacts on endangered cetaceans are described in the FEIS (Section IV.A.4.c.5). The most serious potential impact of an oil spill on a whale would occur on the summer feeding grounds or winter calving grounds, based on the importance of these areas in terms of the whale's life history. Since tanker routes are well offshore from the gray whale calving grounds in Baja, Mexico, the chance of an oil spill impacting the calving lagoons is unlikely. Since there is currently no transportation by tankers of oil north of the Aleutian Island chain, there is no chance of an oil spill on the gray whale's major feeding grounds in the southern Chukchi and northern Bering Seas. Therefore, the most likely time a gray whale would come in contact with spilled oil is during its migration. Since whales have completed successful migrations through the Santa Barbara oil spill and have managed to negotiate through natural oil seeps (which leak some 100 bbls/day [Wilson et al., 1974]) in the Santa Barbara Channel twice every year, impacts of an oil spill on migrating whales are estimated to be sublethal.

Collectively, these existing impacting agents do not appear to have an adverse impact on the whale populations rate of growth (Reilly, 1983; Miles, 1984). Reilly (1984) predicts that the population will continue to rise (even with an annual take of 180 animals) and eventually achieve stability in 150 years.

In summary, the past, ongoing, and projected non-OCS activities and past and ongoing OCS activities are expected to continue to have a low impact on gray whales for the next 35 years.

The non-accident activities associated with the current and future 5-year programs that may impact gray whales include geophysical surveys, the drilling of exploratory and development or production wells, vessel traffic from supply and crew boat bases to drilling rigs or platforms, and helicopter traffic. The additive impacts of these activities, combined with other proposed and existing projects and activities, are expected to increase the amount of noise and disturbance to gray whales in the Alaska and Pacific Regions. These incremental additions would probably be disruptive, especially geophysical activities near Unimak Pass (in the southern portion of the St. George Basin Planning Area). A large proportion of the population migrates through Unimak Pass. (A situation could possibly exist which would lead to a temporary disruption of migration [see DOI, MMS, 1983, pages 29-31].) Increased geophysical activities could cause whales to make deliberate course changes away from the sound source, cause auditory discomfort, and cause the masking of wanted sounds (such as vocalizations). However, there is no evidence that non-explosive acoustic geophysical activity causes injury to animals. Therefore, this incremental increase is not expected to increase the impact level to gray whales.

The cumulative risk of oil spills in the Bering and Chukchi Seas is significant (30 oil spills (see Table IV.B.4-2) are assumed from all oil and gas activities in these planning areas). Although gray whales are found from Bristol Bay to Pt. Barrow during May to November, many (as much as 30-50 percent of the total population) tend to concentrate in the northcentral Bering Sea between St. Lawrence Island and the Bering Strait (in the Norton Basin Planning Area) to feed in the summer. This prime feeding area covers about 35,000-40,000 km<sup>2</sup> (13,500-15,400 mi<sup>2</sup>). The estimated mean number of oil spills in this area is only two (2) for the life of the project (i.e., 35-40 years). The adjacent Navarin Basin Planning Area has an estimated mean number of 13 oil spills. A very large oil spill (100,000 bbls) could cover 2,850 km<sup>2</sup> (1100 mi<sup>2</sup>), or about 8 percent of the feeding area. Assuming two oil spills (1 in the Navarin Basin and 1 in the Norton Basin) any time in the same year (since an oil spill in winter would permeate the ice and be released in the spring), as much as 5 percent of this prime feeding area for 30-50 percent of the population could be impacted due to displacement or decreased food supply. But based on studies by Geraci and St. Aubin (1981, 1983) and on observations of whales exposed to spilled oil, as well as the relatively small percentage of prime feeding grounds that is likely to be contaminated by an oil spill, the cumulative effects of an oil spill should not be evident for any extended length of time and recovery should occur within 1 to 3 years.

**CONCLUSION:** The overall cumulative impacts to gray whales from OCS and non-OCS activities in the Alaska and Pacific Regions are expected to be low.

### (3) Fin and Humpback Whales

The North Pacific fin whale population is estimated to have ranged from 42,000 to 45,000 individuals before whaling began. Due to their speed and the fact that they sank when killed, few fin whales were taken prior to the introduction of modern whaling techniques at the start of the 20th century. By the time fin whaling ended in the North Pacific in 1976, the population had been reduced to 14,620 to 18,630 individuals (Ohsumi and Wada, 1974). Sighting data on fin whales from the North Pacific have been limited, but it appears that the population remains at less than half its pre-exploitation level (Mizroch, Rice, and Breiwick, 1984b).

The pre-1905 humpback population of the North Pacific was probably about 15,000. From 1905 to 1965, about 28,000 humpbacks were taken by whalers in the North Pacific, reducing the population to about 1,000 (Rice, 1978b). The current population is estimated at between 1,200 and 2,100 individuals and may be slowly increasing (Rice, 1978b; Darling and Morowitz, 1986).

The ranges of fin and humpback whales in the North Pacific widely overlap. Both species have been associated with similar water depths in areas of high benthic relief (Brueggeman et al., 1988). Both whales are rorquals and employ similar feeding strategies. Because of these many similarities and the fact that OCS activities would probably have similar impacts on these species, we have decided to group these species together in our analysis of impacts.

The summering grounds of fin and humpback whales are found on waters over the continental shelf mainly from the central and southern Bering Sea, through the Gulf of Alaska, and along the coast of central California. Some of the significant activities that could impact these species include commercial and subsistence fishing, tankering and other shipping, and OCS activities.

Fishing is a large industry with major fisheries for salmon, herring, shellfish, and groundfish. Fishing activity, both commercial and subsistence, probably has some impact on fin and humpback whales through noise disturbance caused by fishing vessels. The impacts of individual vessels are probably quite low; however, the combined impacts of several vessels in an area can produce a zone of high sound level comparable to that produced by a much larger vessel, and may cause whales to move several kilometers to avoid the noise. Another potential



cause of impacts that may exist, but has not been proven, is competition between fishermen and whales for species such as herring and pollock used by whales as a food resource.

Tankering and shipping could impact whales in that the whales would likely attempt to avoid any ships that approach them closely. Also, the tankering of crude oil or refined products would present the possibility of an oil spill. Oil tankering occurs in most Alaska OCS Planning Areas within the range of these species. Tankers transporting North Slope crude depart the Port of Valdez carrying approximately 2 million bbls per day for markets on the Pacific coast, Gulf of Mexico, Hawaii, and Nikiski refinery in Cook Inlet, Alaska. These tankers traverse the Gulf of Alaska Planning Area and all of the Pacific OCS Region Planning Areas.

Approximately 11 oil spills are projected in these planning areas as a result of North Slope crude oil tankering. If an oil spill were to occur, the impacts could vary (from negligible to possible death of weakened or stressed individuals) depending upon where the oil spill occurs and the time of year. Much of the tanker routes are far offshore, and any oil spills occurring in these areas would be unlikely to impact fin or humpback whales.

Oil spills occurring during the summer in Prince William Sound, near the Alaska coastline, or in the Farallon Basin could result in fin or humpback whales being contacted by oil. Whales that contact oil could experience impacts similar to those described for the bowhead whale including inhalation of hydrocarbon vapors, localized reduction in prey organisms, ingestion of spilled oil or oil-contaminated prey, baleen fouling with a transient reduction in feeding efficiency, and possible skin and/or sensory organ damage. However, even if individual whales were contacted by crude oil, impacts are likely to be negligible (Geraci and St. Aubin 1982, 1985). In addition, in Goodale et al. (1981), hundreds of cetaceans (dolphins, and fin, humpback, and possibly right whales) were observed to be feeding inside and outside oil slicks. No difference in feeding behavior was observed in or outside of the oil slick.

Some areas such as Unimak Pass have a high level of shipping traffic, and the noise from these vessels would likely cause fin and humpback whales to evade the vessels if the vessels approach the whales closely. Humpback whales that winter near the Hawaiian Islands are exposed to a high degree of noise and traffic associated with jet skiing, parasailing, and whale watching. There has not been a detectable decline in the wintering population; however, the whales do appear to be moving farther offshore away from the most congested waters (Salden, 1988). This behavior may be detrimental to reproduction or calf rearing since cow/calf pods prefer nearshore shallow waters (Smultea, 1989).

Currently, no further exploration is scheduled within past lease sale areas in Alaska within the range of fin and humpback whales; however, a number of previous lease sales have occurred within the Bering Sea and Gulf of Alaska, and there are active leases on which exploration could occur. Off the California coast, it appears that OCS oil and gas activities are generally not impacting fin and humpback whales on their summer ranges, but there is considerable OCS activity along their migration corridor. Oil and gas activities have the potential to affect these species through noise disturbance or oil spills.

Noise from OCS operations would likely cause fin and humpback whales to avoid the immediate area of the activities; however, the area of avoidance is likely to be rather small. Malme et al. (1985) could find no clear evidence of avoidance of sound-playback sources from several types of industrial activity by feeding humpback whales in southeast Alaska. They also concluded that the avoidance criteria derived for the gray whale could be applied to feeding humpback whales—500 m for a drilling platform, 22 m for a helicopter, 1 km for a drillship, and 1 to 2 km for seismic surveys. The impacts of OCS noise on fin whales has not been studied since this species is not often present in areas undergoing OCS activity. There is no reason to believe that this species would respond much differently to noise than the other whale species previously discussed. Ljungblad et al. (1982) observed fin whales about 36 km from a seismic



boat behaving normally in the presence of seismic noise (estimated received level at the whales was 150 dB/1 uPa). Consequently, it appears that fin whales would display minor avoidance of OCS activities. The avoidance displayed by fin and humpback whales would probably be limited to the migratory season since neither species is expected to winter in significant numbers in areas undergoing OCS exploration and production.

The estimated mean number of oil spills greater than or equal to 1,000 bbls for the remaining recoverable reserves in the Southern California Planning Area is 3. Impacts of oil spills contact with fin and humpback whales would be as previously described.

Noise impacts on these species as a result of activities associated with the current and future 5-year programs would be somewhat higher than under present conditions. As previously described, it is likely that fin and humpback whales would display local avoidance of seismic surveys, drilling, production platforms, and vessel and helicopter traffic. The fin whale population appears to be fairly dispersed, and their migration routes and wintering areas appear to be well offshore (mostly beyond the limits of OCS activity). Consequently, it does not appear that the increase in noise from oil and gas activities associated with the current and future 5-year programs will significantly affect the fin whale population.

As described earlier, principal humpback summering and wintering areas appear to be outside areas of OCS activities, and migrating individuals are likely to be present in the area of OCS activities for only a short time. Also, the humpback migration corridor for those individuals that migrate along the Pacific coast does not appear to occur nearly as close to the coast as the gray whale migration. Consequently, it does not appear that the slight increase in noise from oil and gas activities associated with the 5-year programs will significantly affect the humpback whale population.

The impacts on fin and humpback whales with the addition of the current and future 5-year programs are expected to be qualitatively similar but quantitatively slightly higher than the existing conditions. Within waters on the Alaska OCS, 30 oil spills equal to or greater than 1,000 bbls are assumed to occur within the primary range of these species over the next 40 years. About 20 oil spills are assumed to occur in the next 35 years within the species' range in the Pacific OCS Region. Oil spill impacts would be as previously described.

If some individual animals were to encounter more than one spill in a given year, it is conceivable that some old, weakened, or young whales among these individuals may die; however, due to the generally dispersed nature of the populations, it is unlikely that many individuals would contact multiple oil spills or that more than a few individuals would be seriously injured. One factor that bodes well for the humpback whale is the fact that their larger summer concentrations appear to occur in areas unlikely to have OCS development—the inland waters of Southeast Alaska and the Farallon Basin.

Within Alaskan waters, most humpbacks appear to migrate south toward wintering grounds off Hawaii. Only a few whales (from Southeast Alaska) appear to migrate along the Pacific coast toward wintering grounds off Mexico. Consequently, most of the population would be exposed to potential oil spills from a single planning area (Gulf of Alaska whales) or a few planning areas (Bering Sea whales), and only a minor portion of the population would be expected to be exposed to oil spill risk from activities within both the Alaska and Pacific OCS Regions.

**CONCLUSION:** The cumulative impacts to the fin and humpback whales are expected to be very low.

#### (4) Right, Blue, Sei, and Sperm Whales

This group of whales is quite diverse taxonomically and in terms of habitat utilization. The unifying factor is that these species are rather uncommon in areas undergoing or proposed for OCS activities.

The North Pacific right whale population is very low. Right whales were hunted nearly to extinction by commercial whalers during the 1800's. The current size of the population is unknown, and no reliable estimate is possible given the limited sighting information; however, sighting records suggest that there are probably only a few hundred individuals remaining (Braham and Rice, 1984). There has been no evidence to indicate that the population has been increasing.

The most recent estimate of the North Pacific blue whale population is 1,530 individuals (Wada, 1977); however, there has been little new information on blue whale abundance since hunting ceased in 1967. There have been numerous sightings in the last several years off Mexico and California, but no useful census data for population assessment. Given the relative scarcity of blue whales based on opportunistic sightings, the low population estimates relative to their initial abundance, and the low intrinsic rate of increase noted for this and other baleen whale populations, there is no evidence, to date, that the blue whale stocks in the North Pacific are recovering (Mizroch, Rice, and Breiwick, 1984).

The pre-exploitation population of sei whales in the North Pacific was estimated at 45,000 whales (Ohsumi and Fukuda, 1975). Catches of sei whales in the North Pacific and Bering Sea rose sharply during the 1960's, and then dropped sharply thereafter. The most recent population estimates have varied between 8,600 individuals (Tillman, 1977) to 37,000 individuals (Ohsumi and Fukuda, 1975). There are no indications of population trends for this species.

The number of sperm whales in the eastern North Pacific stock appears to be fairly high. It is estimated that the number of individuals in the eastern North Pacific population large enough to be commercially exploitable—males aged 11 years and older and females aged 10 and over—is about 274,000 (International Whaling Commission, 1979). This is approximately 88 percent of the estimated population prior to commercial exploitation. There is no information regarding recent trends for this species, and it should be noted that new analyses of population numbers using different data sets and biological parameters may produce much different population estimates (Gosho, Rice, and Breiwick, 1984).

Activities not associated with this 5-year program and future 5-year programs that could affect these species would include commercial and subsistence fishing, tankering and shipping, and previous OCS lease sales. Fishing could affect these species through noise disturbance associated with fishing vessels and possibly through competition for species utilized by the whales for food. Whales are likely to show little avoidance of individual fishing vessels since they generally do not produce sound at very high levels; however, whales may show greater avoidance of a number of vessels operating in the same general area because the combined sound level from these vessels could be considerably high.

Tankering and shipping could affect these species through noise disturbance and the potential for an oil spill. Impacts associated with noise have not been evaluated on these species since they are uncommon in the areas of potential OCS interest, but it is believed that they would respond in ways similar to other whale species whose behaviors have been documented in the presence of noise sources. It is likely that these species would avoid any vessels that closely approach them, but their behavior would return to normal shortly after passage of the vessels. For example, blue whales still occupy Monterey Bay, California, despite the fact that vessel



traffic there could be described as moderate, and a local stock of blue whales appears to be doing well in the Gulf of St. Lawrence despite being the object of whale watching trips (Mizroch, Rice, and Breiwick, 1984).

Impacts of shipping noise would appear to be greatest in areas where the traffic appears to be concentrated, such as Unimak Pass. The potential oil-spill impacts from tankering operations is more fully described in the previous section on fin and humpback whales. If an oil spill were to occur and whales were contacted, the impacts are expected to be similar to those described for fin and humpback whales, including inhalation of hydrocarbon vapors, localized reduction in prey organisms, ingestion of spilled oil or oil-contaminated prey, baleen fouling with a transient reduction in feeding efficiency, and possible skin and/or sensory organ damage. However, even if individual whales were contacted by crude oil, impacts are likely to be negligible (Geraci and St. Aubin 1982, 1985). In addition, in Goodale et al. (1981), hundreds of cetaceans (dolphins, and fin, humpback, and possibly right whales) were observed to be feeding inside and outside oil slicks. No difference in feeding behavior was observed in or outside the oil slick.

Currently in Alaska, no further exploratory operations are scheduled on leases acquired in past lease sales within the range of these species; however, a number of previous lease sales have occurred within the Bering Sea and Gulf of Alaska, and active leases remain on which exploration could occur. Off the California coast, it appears that OCS activities are generally not affecting these species. The sperm whale typically inhabits waters deeper than 200 m, and the blue and sei whales are more pelagic in nature than some of the other whale species; consequently, they most often occur in waters not occupied by OCS activities. Right whales are so scarce it is unlikely that they would interact with OCS activities.

Oil and gas activities have the potential to affect these species through noise disturbance and oil spills. In the event that individuals from these species would be present near OCS activities, it is expected that they would respond to the noise as do other whale species, namely displaying localized avoidance of seismic surveys, vessel and helicopter traffic, drilling, and production platforms. The impacts of oil spills on these species would be as previously described.

Noise impacts on these species as a result of activities associated with the current or future 5-year programs would likely be slightly higher than the very low level that exists under present conditions. As previously described, the whales would be expected to avoid the vicinity of OCS activities. However, these species are seldom present in areas of OCS activity so this avoidance is expected to be very minor. Slightly greater impacts on blue whales may be expected if oil and gas activities occur in the Santa Rosa-Cortes Ridge and Tanner-Cortes Banks areas of southern California since blue whales are known to frequent these areas. Localized avoidance of OCS activities could be expected. If this area is avoided, only minor localized impact to the availability of prey would be expected, since these summer feeding grounds cover a wide area.

Oil spill impacts on these species as a result of activities associated with the 5-year programs are expected to be only slightly higher than the very low level that currently exists. Within waters on the Alaska OCS over the next 40 years, an estimated mean number of about 30 oil spills could occur within the normal range of the right whale and sperm whale, and about 11 oil spills within the range of the blue whale and sei whale. An estimated mean number of 20 oil spills could be estimated to occur in the next 35 years within the species' ranges in the Pacific OCS Region. Oil-spill impacts would be as previously described and would appear to be sublethal.

It is anticipated that tanker oil spills could have greater impacts on blue, sei, and sperm whales since tanker routes in most areas are farther offshore and probably closer to the more pelagic habitats utilized by these species. Given the relative rarity of these species in areas of OCS activity, it is unlikely that any individuals would contact multiple oil spills in a given year.

**CONCLUSION:** The cumulative impacts to right, blue, sei, and sperm whales are expected to be very low.

b. Nonendangered Cetaceans

(1) Beluga Whale

The major migratory group of beluga whales in Alaskan waters is the Bering Sea population. This population summers in four different areas in U.S. and Canadian waters. Population estimates for these four summering group areas as follows: Bristol Bay 1,000 to 1,500; Norton Sound 1,000 to 2,000; Eastern Chukchi Sea 2,000 to 3,000; and Beaufort Sea 11,500. Bristol Bay is the only area in which surveys have been thorough enough to provide a baseline for evaluating population trends. Declines in abundance have been reported, although it is uncertain whether these represent a shift in distribution or a decline in population size (Hazard, 1988).

Existing impacting agents that may affect beluga whales program would include subsistence harvest, commercial and subsistence fishing, the Red Dog Mine, tankering and vessel traffic, and existing OCS oil and gas activities (see Section IV.C). Harvests and incidental catches have the most clear and direct impacts on beluga whales. The average annual subsistence kill of beluga whales in Alaska and western Canadian waters is about 570. In all areas except perhaps Norton Sound, harvest mortality appears to be lower than the estimated gross annual recruitment rate. The current trend is a decline in the number of beluga whales harvested as compared with the early and mid-1900's (Hazard, 1988).

Potential impacts to beluga whales from commercial and subsistence fishing activities would include net entanglement, competition for prey, and possibly disturbance due to vessel noise. Bristol Bay appears to be the primary area where net entanglement poses a problem. Entanglement has apparently increased since the 1950's, and is thought to have resulted from the shift from cotton to nylon nets, an increase in the number of set nets, and an increase in the amount of time gear is in the water (Frost et al., 1983). In 1982, at least 1 of the 6 beluga carcasses found was from a fishing-related death; and in 1983, 39 to 44 percent of the 27 to 31 beluga carcasses found were fishing-related mortalities (Hazard, 1988).

Competition for prey species is more often asserted than proven. During the late 1960's and early 1970's, Bering Sea herring were harvested by Soviet and Japanese offshore trawlers in the winter and by foreign-fleet nearshore fisheries in the spring and summer. Tununak residents claimed these harvests severely reduced herring catches and also attributed a decline in the local presence of beluga whales to this fishery (Pete, pers. commun., cited by Hazard, 1988). The fishery was stopped in 1976, and recently the herring biomass has shown a steady increase, and more belugas were sighted during 1985 than during previous years (Whitmore, pers. commun., cited by Hazard, 1988).

The potential for noise disturbance by fishing vessels may vary from area to area. Residents of coastal communities suggest that vessel traffic from increased commercial fishing and other activities may have affected the distribution of the whales. Outboard motors, especially when operated at high speed, have the greatest potential for interfering with beluga communication and echolocation. In an experiment, belugas in Nushagak Bay responded more to outboard motors than to inboard-powered vessels or to playbacks of oil drilling sounds, and outboard motor noise seemed to cause aversion at a considerable distance (Stewart et al., 1982). Residents from western and northwestern Alaska coastal communities attribute the reduced numbers of beluga whales in coastal areas to the increase in boat traffic, particularly those powered by outboard motors, and perhaps other noises associated with modernization. However, in Bristol Bay, beluga distribution appears to be determined by prey distribution, tide, bottom topography, and other environmental factors since belugas often approach fishing boats



and nets and frequent rivers and other areas of especially active fishing effort (Frost et al., 1983).

Operation of the Red Dog Mine and accompanying port may affect some beluga whales. Transport of ore concentrates from the dock to lighters and from the lighters to ore carriers creates the risk of spillage and accompanying water quality degradation as does the transfer of petroleum products, reagents, and other toxic materials. Belugas migrate through the area in leads during the spring and along the coast in June through August and intermittently in autumn. Noise and activity associated with the operation of the port transfer facility would occur year-round and may displace whales offshore, particularly during the ice-free shipping season from late June to early October (EPA and DOI, 1984). The impacts of this displacement are unknown.

Beluga whales could be affected by OCS oil and gas exploratory operations on previously leased tracts. Impacts could occur from noise or oil spills. Sources of OCS exploration noise that may affect beluga whales would include vessels and seismic surveys, helicopters, dredging, and drilling.

Reactions of beluga whales to mobile noise sources such as vessels may be highly variable depending on the animals' prior exposure to the disturbance source and their need to be in a particular habitat area where they are exposed to the noise and visual presence of the disturbance source. For example, Fraker, Sergeant, and Hoek (1978) reported the startle response and flight of beluga whales from barges and boats traveling through a whale-concentration area. Finley and Davis (1984) reported strong fleeing reactions by beluga whales when icebreakers approached at distances of 35 to 50 km in two documented cases. The whales were displaced or moved over 80 km along the ice edge, or they stopped moving within 20 km when they reached coastal waters. Such strong reaction suggests that these whales may have been "naive" with respect to vessel noise. Monitoring of beluga whale behavior and distribution for the past 10 years in the Mackenzie River Delta estuary (in association with marine traffic supporting Canadian oil and gas activities) has not shown any long-term or permanent displacement from the estuary, despite comparatively high levels of industrial activity (Fraker, 1983). Although beluga whales would likely avoid the immediate vicinity of seismic survey operations, it is unlikely this avoidance would last long after the survey vessel departed the area.

Belugas respond to low-flying aircraft by diving for longer periods, spending less time at the surface, and swimming away. Feeding groups are less prone to disturbance (Kleinenberg et al., 1964). It is unlikely, though, that belugas would be significantly disturbed by helicopters making an occasional single pass overhead.

Beluga whales do not appear to be greatly disturbed by dredging operations as they approached within 1 km of an operating suction dredge (Fraker, 1977a; Fraker et al., 1982). Belugas often approach within a few kilometers of drilling operations on artificial islands (Fraker, 1977a, b; Fraker and Fraker, 1979) and even closer to drilling ships.

In the event of an oil spill occurring and contacting beluga whales, impacts generally similar to those described for the bowhead and other whales could occur including inhalation of hydrocarbon vapors, ingestion of spilled oil or oil-contaminated prey, and damage of skin and/or sensory organs. Vapor concentrations harmful to the whales would likely dissipate within a few hours of the oil weathering at the surface; consequently, unless whales were trapped in the immediate area of a fresh oil spill, it is unlikely that they would be harmed by petroleum vapors.

Belugas feed primarily on fish that are wide ranging and thus unlikely to be affected by oil spills. However, in some areas belugas feed on bottom-dwelling species, and it is conceivable that in shallow areas belugas may incidentally ingest some oil or oil-contaminated prey while feeding on these species. Dolphins have shown the ability to ingest some oil without significant detrimental impacts (Caldwell and Caldwell, 1982), and it is suspected that oil ingestion in small amounts by belugas would not be a significant problem.

Contact with petroleum hydrocarbons can irritate or harm sensitive tissues such as eyes and mucous membranes. No data are available on cetacean-eye sensitivity to oil; however, ringed seals exposed to crude-oil-covered water showed signs of eye irritation within minutes after exposure, but eye conditions resolved after being returned to clean water (Geraci and Smith, 1976). Given the time that beluga whales are likely to be exposed to spilled oil or remain within oiled areas, it is unlikely that significant skin or eye problems would result.

On their summer feeding grounds in the Canadian Beaufort Sea, the whales may be subject to some disturbance from activities associated with offshore oil and gas exploration and development and production. The main area of industry interest to date has centered around the Mackenzie Delta and offshore of the Tuktoyaktuk Peninsula (see Section IV.C.). Possible disturbance to beluga whales from helicopters, vessels, seismic surveys, and drilling would be as previously described. Beluga whales would be exposed to the risk of oil spills from exploration, development and production, and transportation of oil from the Canadian Beaufort Sea. Oil spill impacts on the beluga whales would be as previously described.

As a result of the current and future 5-year programs, whales in each of the summering areas are expected to be exposed to noise associated with OCS exploration and development and production. Noise levels are expected to be slightly higher than the very low level that exists currently. Qualitatively, impacts would likely occur as previously described and mainly result in avoidance of the immediate area of the noise source. There are many reports of belugas in the immediate vicinity of Cook Inlet oil platforms. Belugas, including females with calves, pass as close as 10 m to active platforms. McCarty (1981) commented that belugas seem not to be affected by constant noise, but temporarily avoid sudden changes in noise level. The expected noise levels with the current and future 5-year programs would seem to be a slight increase over existing noise levels; however, those noise sources that would exist for the longest time—production platforms—seem to be largely ignored by beluga whales in Cook Inlet. Consequently, it is not expected that noise as a result of the 5-year programs would result in significantly greater impacts than without this alternative.

Impacts of oil spills on beluga whales as a result of the current and future 5-year programs are expected to be somewhat higher than under the present condition. The estimated mean number of spills of 1,000 bbls or greater in the next 40-year period within the range of each of the beluga whale summering groups are as follows: Bristol Bay, 1; Norton Sound, 2; eastern Chukchi Sea, 7; and Beaufort Sea, 3. Not all of these spills would occur while beluga whales are present; in fact, it is likely that less than half of the oil spills would occur while beluga whales are present in the affected planning area. The impacts of an oil spill on beluga whales have been previously discussed. Most often, the impacts of an oil spill in an area occupied by beluga whales would be nonlethal to the whales. However, the most critical time and location of an oil spill would be in an area where beluga distribution is restricted by ice cover. In this case, if belugas were limited to surfacing in a small open-water area and fresh crude oil were spilled into this area, a number of animals could die or suffer pulmonary distress from the inhalation of petroleum vapors. This circumstance could occur within wintering areas in the Bering Sea or along the lead system during the spring migration. This situation is expected to be rather rare since beluga whales would not normally allow themselves to be present in an area in which breathing holes are severely limited. In the event that beluga whales are exposed



to multiple oil spills in the same year, particularly during the spring migration, it is conceivable that a number of old, young, weakened, or stressed individuals could die. However, it is expected that multiple oil spills during the same year within beluga wintering areas or the spring lead system would be rare.

**CONCLUSION:** The cumulative impacts to the beluga whales are expected to be low.

## **(2) Minke Whale**

Although they have a wide distribution, Minke whales are not considered abundant in any part of the North Pacific except Alaska. Little is known of their historic population size, as historically these whales were not actively hunted because of their small size relative to other baleen whales. The information that is available is derived from present day catches from the Okhotsk Sea-West Pacific stocks by Japanese and Korean whalers. Minke whales in the northeastern Pacific are presently protected from whaling. Between 1954 and 1982, 22,746 minke whales were killed in the northwest Pacific. Based on this data and historical catches of minke whales, the size of the West Pacific stock was estimated in 1981 to contain 17,000 to 28,000 animals. The northeast Pacific population may contain similar numbers.

Currently, the major impacts affecting this species are noises from vessels and OCS activities, and oil spills. Minke whales, in all likelihood, respond to noises and spilled oil like other baleen whales. The generic impacts of noise and oil spills on cetaceans are discussed in the FEIS (Section IV.A., pages IV.A-64 to 84).

Nishiwaki and Sasao (1977) suggest that increased ship traffic in Japanese waters disturbed migration routes of minke whales. No similar observation has been made on the northeastern population. Therefore, it is unknown what, if any, impact current or future vessel traffic has or will have on migrating minke whales.

Minke whales that calve in the Southern California Bight are probably the most sensitive to noise and human disturbance due to this critical stage. However, in the humpback whale, a closely related species, there has not been a detectable decline in the population despite the increased noise and traffic associated with jet skiing, parasailing and whale watching expeditions near the calving grounds off Maui, Hawaii (Salden, 1988). Whales, however, are generally moving farther offshore away from congested waters. Therefore, cow/calf pairs may be displaced from preferred habitats by repeated disturbance in the Southern California Bight, but impacts to the population as a whole are expected to be low over the next 35-year period.

Impacts from an oil spill would occur to minke whales while they are present at summer feeding grounds and/or the winter calving grounds. Since most baleen whales do little feeding during migration or on the calving grounds, most of their blubber layer is put on during summer feeding. Therefore, the summer feeding grounds are important to allow individuals to build up energy reserves necessary to sustain themselves through a migration cycle. However, since the minke whale's food (mostly euphausiids and copepods crustaceans) has a patchy distribution and a high turnover rate, an oil spill would have to occur during the feeding season, cover a very large area, and be persistent to have anything other than a temporary, local impact on whales. Impacts from an oil spill would be exacerbated if a similar oil spill were to occur during the same migration cycle, while animals were on the calving grounds. While on the calving grounds, cows are already stressed from the long migration, giving birth, and nursing the calf.

The estimated number of oil spills from existing oil and gas activities (see Table IV.B.4-2) is 7 for the Gulf of Alaska and 7 for southern California. Assuming oil spills occur in both the Gulf of Alaska and the Southern California Planning Areas and contact minke whales, these oil spills would have to occur during both critical seasons (i.e., in summer in Alaska, and winter in southern California) to have greater than a sublethal impact on the minke whales. However, if

it is assumed that an oil spill occurs independent of season of year and with uniform frequency over the 35-to 40-year period within the planning areas, it is unlikely that an oil spill would occur during both critical periods within a migration season. However, if an oil spill were to occur and contact the minke whale, the population would probably recover within one generation.

In summary, there is a low probability that an oil spill would contact minke whales at critical times of the year. If oil spills did occur, the impacts on the population do not appear lethal and, thus, would be very low.

The activities associated with the current and future 5-year programs which may impact minke whales include the drilling of exploratory and development-production wells, vessel traffic from supply and crew boat bases to drilling rigs or platforms, and helicopter traffic. The additive impact of these activities, combined with other proposed and existing projects and activities, are expected to increase the amount of noise and disturbance on minke whales in the Alaska and Pacific Region. This incremental addition is not expected to increase the level to this species above the very low impact that is expected from past, ongoing and projected non-OCS activities, and past and ongoing OCS activities.

The risk of oil spills from the 5-year programs in the Gulf of Alaska and the Southern California Planning Areas is small when compared to the total estimated mean number of oil spills from all sources (Table IV.B.4-2). However, the increase in the estimated number of oil spills is not expected to increase the level of impact above the very low level of impact that is expected from past, ongoing and projected non-OCS activities, and past and ongoing OCS activities.

**CONCLUSION:** The cumulative impacts from OCS and non-OCS activities in the Alaska and Pacific Regions within the range of migrating minke whales are expected to be very low.

### (3) Harbor Porpoise

Only recently (Barlow, 1988) has there been a comprehensive survey of harbor porpoises on the Pacific Coast. Since these surveys are the first done for this species, no conclusions can be made as to whether the population is stable or changing.

The most obvious existing impact agent affecting this species is mortality caused by entanglement in gillnets set to catch commercial fish (see Section III.B.2.c.). Gillnet mortality in California has been estimated at  $300 \pm 190$  individuals in 1983-84 and  $200 \pm 50$  in 1984-85 (Diamond and Hanan, 1986; Hanan et al., 1986). In California, harbor porpoises are the fourth most frequently stranded animal (behind sea lions, harbor seals, and elephant seals) (Seagers, 1986). This incidental take has been of particular concern to the NMFS because, until recently, little information has been available on the animal's population status as a whole. Consequently, the actual impact of gill net fishing on the population is currently under investigation (DeMaster et al., 1985).

For the purpose of this analysis, it is assumed that the population is approximately 46,000 animals for the Pacific Region (see Section III.B.2.c.). With a take of 500 animals (i.e.,  $300 \pm 190$ , see above) in California by gillnetters and assuming a take of 500 in Oregon and Washington, the total assumed take for the Pacific Region could be as high as 1,000/year or 2.2 percent of the total population. The maximum growth rate for phocaenids is probably 10 percent/year (Barlow, 1986, as cited in Read and Gaskin, 1988). However, assuming the maximum growth rate and taking into consideration current population levels, it is expected that the harbor porpoise population can recover from losses by the next generation (i.e., 4 years). Impacts in Alaska are probably similar to those described above.



The harbor porpoise, primarily a nearshore animal, would be susceptible to nearshore pollution. The sublethal impacts resulting from organic contaminants on cetaceans have only recently been investigated (Reijnders, 1986; Subramanian et al., 1987; Ono, 1987; Tanabe et al., 1988). Some of these investigations suggest that present levels of organic pollutants could cause imbalances in sex hormones and subsequent reproduction abnormalities in cetaceans.

As a nearshore animal, the harbor porpoise has come in contact with human activities/disturbances. This species has probably habituated to these types of disturbances. It may, therefore, be assumed that noise from existing vessels has negligible impact on the productivity of the population and no discernable lethal effects on the species.

Oil-spill impacts on cetaceans are discussed in the FEIS (Section IV.A.4.c.5). Since these animals frequent bays and harbors (unlike most cetaceans), they could be susceptible to chronic small spills as well as, the more toxic impacts of oil spills (greater than 1,000 bbls) which may occur or become concentrated in a sheltered bay or harbor. Smith et al. (1983), reported that bottlenose dolphins can detect and actively avoid oil; presumably so could harbor porpoises, thereby reducing their risk of contact. Additionally, as reported by Geraci and St. Aubin (1982) and Hansen (1985), smooth-skinned cetaceans suffer only minor sub-lethal impacts when exposed to spilled oil. An oil spill would not affect their food, since they feed primarily on schooling fish which have a patchy distribution. Therefore, an oil spill would have to be very large, covering a major feeding area to have anything other than a local, temporary impact on these animals.

In summary, it is not possible to accurately estimate the impact of gill netting or organic pollution on this species because only recently have any pertinent baseline population data become established. Barlow (1988) points out that his estimates of abundance in northern and central California (surveyed in 1984 to 1986) correspond with Dohl et al. (1983) estimates (surveyed in 1980-83) (which may suggest a stable population); however, he adds that their methodologies were different and, therefore, are not directly comparable. However, assuming documented mortality in California is similar throughout the Alaska and Pacific Regions, impacts from gill netting is probably moderate on harbor porpoises. Impacts of existing noise and oil spills on this species are estimated to be negligible.

The only activities associated with the current and future 5-year programs that may impact harbor porpoises is vessel traffic from supply and crew boat bases to and from drilling rigs or platforms. The additive impact of this activity combined with other proposed and existing projects and activities is expected to increase the amount of noise and disturbance on harbor porpoises in the Alaska and Pacific Regions. However, the incremental addition is not expected to increase the level of impact to this species above the current level from past, ongoing and projected non-OCS activities, and past and ongoing OCS activities.

**CONCLUSION:** The cumulative impacts on harbor porpoises from OCS and non-OCS activities within the Alaska and Pacific Regions are expected to be moderate.

c. Pinnipeds

(1) Northern Fur Seal

The world population of northern fur seals is estimated at 1.2 million (Fowler, 1985a). About 827,000 comprise the Pribilof Islands population, while about 4,000 are associated with San Miguel Island off Santa Barbara, California. A small breeding group also has become established on one of the Aleutian Islands. The Pribilof population has been declining since the 1950's, interrupted by one period of increase; between 1975 and 1981 the rate of decline was estimated at 4-8 percent per year (Fowler, 1985b). Since 1981, the trend has not been statistically significant (York and Kozloff, 1987); however, the northern fur seal has been

designated as depleted under the Marine Mammal Protection Act. There has been no commercial harvest of fur seals on the Pribilof Islands since 1984, although a small subsistence harvest has taken place (Zimmerman and Melovidov, 1987).

Although some fur seals are found throughout their range at all times of the year, the majority are found in the North Pacific during winter and spring (December to May) and in the Bering Sea during summer and fall (May through November). Fur seals rarely come ashore except at the rookeries. During summer, they are concentrated over the continental shelf in the vicinity of the Pribilof Islands and southeastward to the eastern Aleutian Islands. Fall migration proceeds through eastern Aleutian passes and follows the edge of the shelf around the Gulf of Alaska and south to offshore wintering areas from British Columbia to California. Spring migration retraces much of this path but many females and young males follow a more direct route from the Pacific northwest across the gulf to Kodiak Island and the eastern Aleutians (Bigg, 1982; Fiscus, 1978).

Activities that could produce adverse impacts include oil and gas development in the Bering Sea, Gulf of Alaska, and California, including oil spill cleanup activity; commercial fishing operations; and subsistence harvests. Certain climatic impacts (e.g., El Nino), altered prey distribution or abundance, or predation also may exert periodic influence. Agreement is lacking on the factor(s) causing the population decline. Decreased carrying capacity of the environment due to overfishing has been suggested, but this is not supported by stable reproductive rates, increased pup survival and weight, and increased fur seal body size. In fact, increased food availability is indicated.

The current small subsistence harvest is not likely to influence the size of the population significantly, but impacts of past commercial harvests, if any, could continue for some time. A decline in the number of fur seals appears to be the result of factors causing increased mortality of juvenile classes at sea. Entanglement in debris, especially lost fishing nets or fragments, may be a significant cause of mortality, but other factors also may contribute. Organic pollutants, accumulated on the winter range, which adversely affect reproduction in other pinnipeds (DeLong et al., 1973; Reijnders, 1986) do not appear to have a significant impact on fur seal reproduction. Neither did the 1983 El Nino episode appear to alter fur seal food availability in Pribilof foraging areas as may have been the case on San Miguel Island where female foraging trips increased in length during this period.

Since much of the fur seal's insulation derives from the pelage rather than a thick fat layer, they rapidly incur fatal hypothermia if the fur layer is fouled by oil. Oil also may be transferred to pups by females returning from feeding trips. Impacts of oiling, including surface contact; inhalation and ingestion; as well as noise associated with development, are discussed in DOI, MMS (1985) and by Geraci and St. Aubin (1988).

Significant impacts of oil and gas development on the fur seal population are most likely to occur when seals are concentrated in the eastern Aleutian-Pribilof Island axis in late spring, summer, and fall. Near several rookeries where summer densities are 250+ seals per square kilometer, up to 77,000 seals could be contacted by a 10,000-barrel oil spill, estimated to form a discontinuous slick covering 310 square kilometers (Ford, 1985). Mortality of this magnitude could result in a high level of impact and require two or three generations for the population to recover. In pelagic areas further offshore, along the shelfbreak and nearer to the Aleutian Islands, where densities are lower, impacts are more likely to be moderate. Likewise, where densities are relatively low, along most of the migration route, in wintering areas, and in the vicinity of the Pribilof-Unimak Pass corridor early in the breeding season, impacts of an oil spill are likely to be low. A large volume oil spill, essentially surrounding the Pribilof Islands, thereby forcing a large proportion of the population into contact, could result in very high impacts.



An oil spill contacting the Pribilof Islands-Unimak Pass intensive use area is most likely to originate from existing leases in the St. George Basin or North Aleutian Basin, or from tankers serving Navarin or Norton Basins as a result of previous lease sales. The probability that oil spilled in the St. George Basin (DOI, MMS, 1985) would contact the islands within 30 days in summer can be as high as 71 percent, and greater than 99 percent for entering the area within a 50-mile radius surrounding them. Fur seals foraging to the north of the islands could be contacted by an oil spill in the Navarin Basin (DOI, MMS, 1984). Those migrating in the Gulf of Alaska and further south could be contacted by oil spills from tankers transiting the west coast from the TAPS terminal in Valdez. Fur seals wintering off California or breeding on San Miguel Island could be exposed to oil spills originating from existing production in the Southern California Planning Area. For this analysis, it is assumed that an oil spill would contact the Pribilof Islands as a result of development on existing leases in the St. George Basin. This could result in a moderate impact to the species and recovery is assumed to occur within one generation. The impacts on fur seals from past, present, and future non-OCS and past, and present OCS-related oil and gas activities are expected to be moderate.

Helicopter traffic between St. Paul and the St. George Basin is likely to result in very low impacts among males establishing territories in spring. Disturbance of rookeries when pups are present could have more serious impacts, but still are likely to be low. Vessel traffic is not likely to have significant impacts. Oil spill cleanup activities on or near rookeries during the breeding season could displace some adult seals from these areas and result in some mortality of pups trampled by stampeding adults. Impacts from air and vessel traffic, and oil spill cleanup, are not expected to be sufficiently adverse to increase the aggregate impact to a level greater than that for oil spills, but their occurrence could cause the cumulative impact to occur with greater certainty.

The fur seal's migratory habits could expose the population to impact producing agents associated with oil and gas development in several planning areas included in the current and future 5-year programs (Navarin, Norton, St. George and North Aleutian Basins; Shumagin, Kodiak, Cook Inlet; Gulf of Alaska, Washington/Oregon; and all of California). The cumulative number of oil spills estimated for this substantial area from all sources is 52 (see Table IV.B.4-2), including tankers carrying Beaufort and possibly Chukchi Sea oil via the TAPS, to which fur seals could be exposed along much of their migration route. This suggests that multiple oil spills could contact various segments of the population, in the same year or sequentially, over the life of the current or future 5-year programs. Multiple large oil spills contacting rookery areas during the pupping season, or vicinity of Unimak Pass at peak migration, within the equivalent of a generation (i.e., 4-6 years) could elevate the potential impact to high or very high levels. Where fur seal densities are much lower than in the vicinity of the Pribilof Islands in summer and fall, development of leased areas as a result of the current and future 5-year programs may not elevate overall impacts significantly above the levels projected for existing lease areas. Disturbance of seal rookeries is not likely to increase significantly as a result of additional activities associated with the 5-year programs.

Where fur seals are relatively concentrated, in the vicinity of the Pribilof Islands in summer and fall and during peak passage through Unimak Pass, a high level of impact could result from an oil spill. Moderate impacts are more likely where densities are substantially lower, farther from the islands, along the migration route south of Unimak Pass, and in wintering areas off California.

It is assumed for the purpose of this analysis that the estimated 52 oil spills with the addition of the current and future 5-year programs would occur with uniform frequency over the 35- to 40-year life of the program. It is more probable that multiple oil spills would occur and contact the northern fur seal during periods of concentration or along its migratory route. It is therefore,

assumed with the addition of the current or future 5-year programs that an oil spill contacted the northern fur seal in the vicinity of the Pribilof Islands during the summer and fall period of peak concentration and a second spill contacted the northern fur seal during peak passage through Unimak Pass. As a result of these contacts, impacts to the fur seal would be elevated to a high level and it is expected recovery would require two to three generations. Although disturbance impacts are not expected to increase the aggregate impact above that for oil spills alone, they could cause the cumulative impact to occur with greater certainty.

**CONCLUSION:** The cumulative impact on the northern fur seal is expected to be high.

## **(2) Steller Sea Lion**

The world Steller sea lion population is estimated to be well under 100,000 and declining precipitously from the central Aleutian Islands to the Kenai Peninsula. Numbers in the western Aleutians, eastern Gulf of Alaska, southeast Alaska, Canada and Washington, Oregon appear stable at present. Their range extends south to southern California. Between the 1950's and 1970's the eastern Aleutian population declined about 50 percent, and since then has continued to decline at about 7 percent per year. The causes of the decline are unknown but may involve reduced fecundity or increased mortality. Numbers in the central Aleutians are stable and those in the central and western Gulf of Alaska are declining, but at a lower rate than in the eastern Aleutians. No commercial harvest has occurred since 1972.

Activities that could produce important adverse impacts on sea lions include oil and gas development on current leases in the Bering Sea and Gulf of Alaska, and commercial fishing operations. Altered prey distribution/abundance, and diseases, particularly those resulting in reproductive failure or juvenile/adult mortality, may be important factors in declining sea lion populations. Evidence of two disease organisms that could be responsible for reproductive failure and mortality has been found in Alaskan sea lions (Merrick et al., 1987). Changes in the abundance of the size prey (pollock) thought to be preferred by sea lions have occurred (the large fish targeted in the pollock fishery), but too little information on sea lion foraging patterns is available to confirm or reject a relationship between the changes and sea lion declines.

Factors, which by themselves are unlikely to explain the declines in some areas but which may contribute to them, include changes in oceanographic conditions, subsistence harvest, predation, killing of individuals for bait and predator control, entanglement in net fragments and other debris, incidental taking in fisheries (which may be substantial), harassment, chemical pollutants, and residual impact of commercial harvest. How important most potential factors currently are is speculative. It is evident that in the eastern Aleutians and perhaps in the western Gulf of Alaska some factor or factors are causing a decline in the population.

Since the insulation among older sea lions derives from a thick fat layer, they are relatively insensitive to oil contact; however, oil may be transferred to the more sensitive pups by females returning from feeding trips. Impacts as a result of contacting, inhaling and ingesting oil, as well as noise associated with development, are discussed in DOI, MMS (1985) and by Geraci and St. Aubin (1988).

Significant impacts of oil and gas development on the sea lion population are most likely to occur when sea lions are concentrated at rookeries in late spring, summer, and early fall. Major rookeries are located in southeast Alaska, northeastern Gulf of Alaska, south of Kodiak Island and the Alaska Peninsula, throughout the Aleutians, on Walrus Island in the Pribilof Islands, and on Amak Island north of the Alaska Peninsula. Currently, oil-spill impacts probably would be most severe in the eastern Aleutians where the sea lion population is declining sharply. An oil spill contacting this area is likely to originate from existing leases in the St. George Basin, or potential transportation by tanker from existing leases in Navarin or Norton Basin if oil is



discovered. Except in the event of a tanker grounding in the Unimak Pass area, the probability of an oil spill contacting this area within 30 days in summer ranges up to 78 percent (DOI, MMS, 1983).

Following the breeding season, movements between rookeries and haulouts occur, as well as a substantial movement of males north to St. Lawrence Island, and a movement of individuals from the Aleutians to the ice front of the central Bering Sea in winter. Sea lions involved in these movements could be at risk from oil spills originating in the North Aleutian, St. George, Navarin, and Norton Basins; and thereby, would be subject to low impacts. The overall cumulative impacts from past, present and future Non-OCS and past and present OCS activities are moderate.

Post-breeding season dispersals by sea lions could result in their exposure to oil spills in several areas proposed for leasing as a result of the current and future 5-year programs. Documented dispersals include: movements throughout the Gulf of Alaska and south to British Columbia; northward movements from California to the Pacific Northwest, Canada, and southeast Alaska; movements north to St. Lawrence Island and the ice front. Movements between the three North Pacific areas where segments of the sea lion population are concentrated (Aleutian - Bering Sea, Gulf of Alaska, southeast Alaska - California) potentially could expose some portion of the population to oil spills estimated to occur over the next 35-to 40-year period. Exposure is more likely to be restricted to these subregions where 19, 13, and 20 oil spills are estimated, respectively (see Table IV.B.4-2).

The population is most vulnerable where substantial rookeries are located (a large proportion of overall pup production occurs at relatively few rookeries) and declines are being experienced, mainly the eastern Aleutian and western Gulf of Alaska areas. In such areas, moderate to high oil spill impacts could occur. Likewise, oil spills in the vicinity of the larger rookeries in California, Ano Nuevo Island and Cape Mendocino, could result in moderate to high impacts for this region. As a result of substantial movement within, and to some extent between, these areas, multiple oil spills could contact various segments of the population, in the same year or sequentially over the next 35- to 40-year period. Therefore, two oil spills were assumed to contact the species during the steller sea lion's migratory route. Multiple large oil spills contacting rookery areas during the pupping season within the equivalent of a generation (i.e., 3-5 years) could elevate the potential impact, particularly in areas where the population is declining. Where densities are substantially lower, such as in Alaskan areas with relatively minor rookeries and haulouts (e.g., northwestern Gulf of Alaska, northern Bristol Bay, central Bering Sea) and from southeast Alaska southward, development of leased areas as a result of the current and future 5-year programs may not elevate overall population-level impacts significantly higher than levels noted above. Although locally the impacts may be quite significant, occurrence may become more certain. Disturbance of sea lion rookeries is not likely to increase as a result of the current and future 5-year programs.

In the eastern Aleutians, where sea lions apparently are experiencing high to very high impacts from non-OCS factors, the additional impacts of oil spills could highly influence their survival. In other portions of their range where they are concentrated, primarily in the vicinity of major rookeries in summer, a high level of impact could result from an oil spill, especially in areas of declining population. Low to moderate impacts are more likely where densities are substantially lower, such as in the vicinity of minor rookeries, haulouts, and wintering concentrations throughout their range from Alaska to California. Multiple oil spills, more probable as a result of the addition of the current and future 5-year programs, could increase impacts particularly in areas where the population is declining. Since multiple oil spills could contact various segments of the population, in the same year or sequentially over the next 35- to 40-year period two oil spills were assumed to contact the species during the steller sea lion's

migratory route resulting in a moderate impact to the overall population. Disturbances are not expected to increase the aggregate impact above that for oil spills alone.

**CONCLUSION:** The cumulative impact on the Steller sea lion is expected to be moderate.

### (3) Guadalupe Fur Seal

These animals are known to breed only on Guadalupe Island, Mexico. In the Pacific Region, a few nonbreeding individuals have been seen on San Miguel Island each year since 1969 during the breeding season (Seagars, 1984). The number of seals seen on the island has ranged from one to a maximum of five animals in 1978. The species has also been seen at San Nicholas, San Clemente, and Santa Barbara Islands (Stewart et al., 1985).

Pre-exploitation population levels have been estimated at 30,000 animals. The latest count (Seagars, 1984) is of some 1,600 animals. However, Seagars (1984) indicates that the population is probably increasing at a rate of 5 percent based on censuses done in 1977 and 1984.

The major reason for the decline of this species was over-hunting in the late 1800's to early 1900's (until it was thought to be extinct). Other man-caused disturbances (noise and vessel traffic) probably impacts this species as they impact other pinnipeds; however, the Guadalupe fur seals' numbers are so low they rarely come in contact with these impacting agents. Impacts of commercial fishing in waters adjacent to breeding areas on Guadalupe Island, Mexico, or the (as yet unknown) feeding grounds are not known.

Unlike other pinnipeds, fur seals rely on their fur for insulation from the cold marine environment. Oil reduces its insulation value by removing natural oils which waterproof the pelage. Koryman et al. (1976) reported that fouling only one-third of the body of a fur seal results in a 50 percent greater heat loss that eventually leads to hypothermia and death. Therefore, fur seals, unlike other pinnipeds, are extremely vulnerable to contact with spilled oil. The estimated mean number of oil spills in the Southern California Planning Area from existing oil and gas activities is 7 (see Table IV.B.4-2). In this analysis, a large oil spill is assumed to occur and contact the northern Channel Islands (especially San Miguel Island) during the next 35 years. Since fur seals are only seasonally present on the islands, an oil spill would have to occur in May-July to impact these animals. If such an oil spill were to occur and contact San Miguel (or San Nicholas) Island when fur seals are present, impacts would be moderate if the few seals present are assumed to be killed. It would take several years (at least more than one generation) for the population to reappear at these sites. However, assuming that spills are likely to occur in any season, the probability of an oil spill contacting San Miguel when seals are present is 25 percent. It is assumed that an oil spill would not occur and contact San Miguel or San Nicholas Islands while the fur seals are present. If an oil spill occurred and contacted the Guadalupe Island while the fur seals are breeding potential impacts could be very high. However, data associated with the oil-spill model for the Southern California Planning Area indicates it is unlikely that an oil spill would contact Guadalupe Island. It was therefore, assumed that an oil spill would not contact Guadalupe Island. Therefore, the impacts from past, present and future Non-OCS and past and present OCS activities is expected to have a very low impact on guadalupe fur seal.

Since seals are pelagic in the nonbreeding season and could be found anywhere in the Southern California Bight, the only activity of the current or future 5-year programs that may impact them is vessel traffic from supply and crew boat bases to and from drilling rigs or platforms. The additive and/or synergistic impacts of this activity combined with other proposed and existing projects and activities in the area is expected to increase the amount of noise and disturbance on fur seals. However, the incremental addition of those activities is not expected



to increase the level of impact to this species above the current levels as a result of existing projects or proposals.

With the addition of the current and future 5-year program, there is an additional risk of an oil spill occurring in Southern California Planning Area (See Table IV.B.4-2). For the purpose of this analysis, it is assumed that the additional oil spills will contact different areas. (Therefore, no island or area is contacted more than once by an oil spill as opposed to a single island or area being contacted several times.) Using this assumption, it is not expected that multiple oil spills would contact San Miguel Island and, to a lesser extent, the southern Channel Islands more than once during the life of the project. Therefore, the overall cumulative impact to the Guadalupe fur seal is expected to be very low with no discernible lethal effect.

**CONCLUSION:** The cumulative impacts from OCS and non-OCS activities within the range of Guadalupe fur seals are expected to be very low.

#### (4) California Sea Lion

The world population of the California sea lion (not including the population in the Galapagos) is estimated to be over 157,000 animals (DOC, 1987).

In the Pacific Region, the California sea lion is the most abundant pinniped on land and in waters over the continental shelf (200 m in depth). Total population growth estimates, based on pup production records, are about 7 percent, representing a potential doubling of the population every 10 years (Bonnell et al., 1983). As a result of increased numbers, animals are also expanding their range. Sea lions are becoming common offshore the Pacific Northwest where they were almost unheard of before the 1970's.

As evidenced by their exponential growth rate (Bonnell et al., 1983:80), the California sea lion population appears to be little affected by anything currently taking place in their environment. The California sea lion is a highly adaptable species and is known to tolerate a multitude of incidental disturbances. When disturbed from rookeries by man or storms, they are known to move to nearby areas and reconstitute social structures (Peterson and Bartholomew, 1967). Unlike most other pinnipeds, sea lions are known to have coexisted with Native Americans on offshore islands for thousands of years. As such, it is obvious that man-caused noises in the marine environment (e.g., vessel traffic, helicopter traffic, exploratory and development rigs) have little impact on the California sea lion population. However, this does not imply that excessive, widespread harassment (especially on rookeries) has no impact on this species.

The NMFS authorizes an incidental take of almost 2,000 sea lions a year by commercial fisherman (DOC, 1987). Based on current population levels, the sea lion population, as a whole, appears to be little impacted by gillnet mortality.

Organic pollutants are known to cause reproductive failure in harbor seals (Reijnders, 1986), and DeLong et al. (1973) suggest a possible cause-impact relationship between high levels of organic pollutants and premature birth in California sea lions. However, this type of mortality probably claims only a small portion of the year's pup population. (DeLong et al. (1973) counted 290 premature pups for some 10,000 females on San Miguel Island and 442 dead pups for 5,500 females on San Nicholas Island.) Therefore, over the next 35-year period, organochloride pollutants are expected to have a negligible impact on the California sea lion population as a whole.

Impacts of an oil spill on pinnipeds are discussed in the FEIS (Section IV.A.4.c.5). Pinnipeds, other than fur seals, appear not to be affected greatly by spilled oil (St. Aubin, 1987). Only in cases of very large oil spills has any outright mortality been noted in these pinnipeds. Further,

sea lions appeared not to have been greatly affected by the Santa Barbara oil spill (Bonnell and LeBoeuf, 1971) or by natural oil seeps in the Santa Barbara Channel.

Oil spill impacts are largely sublethal. It is estimated that an oil spill would have to contact two rookeries in the Pacific Region within 4-6 years (1 generation) during the breeding season to have an impact greater than very low on this species. Based on a uniform distribution of oil spills along the species migratory range, it is expected that only one spill would contact a rookery within 4-6 years. Therefore, the expected overall cumulative impact from past, present and future Non-OCS and past, and present OCS activities is very low.

The only impacting agent associated with the addition of the current and future 5-year programs that may affect sea lions is vessel traffic from supply and crew boat bases to drilling rigs or platforms. However, the additive and or synergistic impact of this activity combined with other proposed and existing projects and activities is expected to increase the amount of noise and disturbance on sea lions in the Pacific Region. However, the incremental increase is not expected to raise the level of impact to this species above the levels associated with past, ongoing and projected non-OCS activities, and past and ongoing OCS activities.

The additional risk of an oil spill is significant for the Southern California Planning Area. The estimated mean number of oil spills is 7 from existing oil and gas activities; with the addition of the current and future 5-year programs the estimated number is 12 (See Table IV.B.4-2). Although these oil spills could occur anywhere in the planning area, oil spills near the Channel Islands (i.e., major rookeries) could cause pup mortalities. Combined with the other types of man-caused mortalities (from gillnetting and ocean pollution), multiple oil spills near major rookeries during the breeding season within 4-6 years could cause impacts that would be evident for several generations. However, it is unlikely that all these conditions (multiple oil spills near the major rookeries during the breeding season within 4-6 years) would occur. Therefore, it is assumed that multiple spill would not contact the major rookeries during the breeding season with 4-6 years. The overall cumulative impact to the California sea lions are expected to be very low.

**CONCLUSION:** The cumulative impacts from OCS and non-OCS activities within the range of California sea lions are expected to be very low.

#### (5) Ice Seals

Four seal species in Alaska (spotted, ribbon, bearded, ringed) are ice associated for much or all of the year. Although the general range of all four species extends from the southeastern Bering Sea to the Beaufort Sea, that of spotted and ribbon seals are more predominantly found in the Bering Sea, while the distribution of bearded and ringed seals exhibits more arctic affinity. Estimated maximum populations of these seals in the Bering, Chukchi, and Beaufort Seas are: spotted, 250,000; ribbon, 110,000; bearded, 300,000; ringed, 1.5 million. All four ice seals breed and give birth in spring, spotted and ribbon in the ice front, bearded in drifting pack ice, and ringed mainly on shorefast ice. In summer, bearded and ringed seals remain ice associated in northern Chukchi and Beaufort Seas, spotted seals occupy coastal areas, and ribbon seals become pelagic. Bearded and ringed seals undertake the more extensive migrations of the four species.

Past, ongoing and projected non-OCS activities, and past and ongoing OCS activities that could produce adverse impacts on ice seals include oil and gas development on current federal leases in the Beaufort, Chukchi and Bering Seas; commercial fishing operations; subsistence harvest; and disturbance from operation of aircraft, vessels, vehicles, construction, and other human activities in areas where these seals are engaged in activities that make them especially vulnerable. Production and transportation of oil is likely to cause the greatest impact. The effect of commercial fishing activities on prey populations used by ice seals is not presently



known but could be substantial. The impact of the current subsistence harvest on these populations is not known to be significant.

Regional populations of all four ice seal species make seasonal migrations sufficient to expose them to oil spills in more than one planning area. In addition, that portion of each population occupying southern parts of their range could be exposed to tanker spills.

Insulation of these species is provided by a thick fat layer so external contact with oil is not likely to be fatal, unless they already are severely weakened or stressed, though they may experience temporary eye and skin inflammation or inhale hydrocarbon vapors that could elevate their physiological stress. Experimental studies do not indicate that ingestion is likely to be fatal. Insulation of the newborn pups, however, is provided by long hair that is vulnerable to fouling by oil and could result in death from hypothermia during the first weeks following birth. The presence of oil in the water or on ice might disrupt mating activity, potentially resulting in decreased productivity in the year of occurrence.

Ribbon seals are most vulnerable when molting on ice remnants in late spring when they are under stress, and may suffer some minor effects due to the loss of the insulation properties of the fur. Some minor reduction in the availability of food resources (e.g., arctic cod) near a spill site could occur and affect, for example, breeding ringed seals by potentially reducing milk production.

An oil spill could result in a substantial adverse effect on one or more of the ice seals' population. Since the individuals of each population are highly dispersed throughout their range, an oil spill would only contact a limited number of individuals from a particular ice seal population. Also, rapid recruitment from adjacent areas after an oil spill has dispersed probably would result in this being a short-term effect. In all, this is not expected to exceed a low level of impact to the overall population. Helicopter traffic between shorebases and drilling rigs or platforms would be the primary source of disturbance to ice seals. Although this type of disturbance would be brief, the impact on individual seals, particularly pups, could be severe. Because the adults and adults with young are widely distributed for most of the year, helicopter flights are not likely to disturb a major proportion of the seal populations. However, injury or death of small numbers of young is possible. Vessels supporting drilling activities would be present primarily in the open-water season from the central Bering Sea northward. These vessels would follow the retreating ice front in May and June, using the primary lead system in the Chukchi Sea. Such traffic may coincide with seals using the same general lead system or route, and temporarily interfere with local movements or displace hauled out individuals. However, there is no evidence that vessel traffic would block or significantly delay seal migrations or result in greater than low level impacts on their migration or distribution. Construction of shorebase facilities could displace some spotted seals, but is likely to affect an insignificant proportion of the population. Oil-spill cleanup activities, like other human activities, would displace seals temporarily from their vicinity for the duration of the activity.

The ice seals' migratory habits could expose their populations to adverse factors associated with oil and gas development in several planning areas included in the current and future 5-year programs (Beaufort Sea, Chukchi Sea, Hope Basin, Norton Sound, Navarin Basin and St. George Basin). The cumulative number of oil spills estimated for this area from all sources is 29 (Table IV.B.4-2). It is assumed, based on an uniform distribution of oil spill, that multiple oil spills would contact various segments of the populations in the same year or sequentially, over the life of the current or future 5-year programs. Multiple spills, when released from the pack ice, repeatedly contacting females with pups on the ice could cause substantial local mortality; however, at typical densities it is not likely that more than a few hundred individuals would be affected requiring less than one generation for recovery, representing a low level of impact. With the addition of disturbance impacts associated with oil and gas development in

current and future 5-year programs, such as increased physiological stress levels, would increase the potential oil-spill impacts described above; however, none are likely to be sufficiently adverse to elevate the impact of oil spills plus disturbance above that for oil spills alone.

**CONCLUSION:** The cumulative impact on ice seals is expected to be low.

#### (6) Pacific Walrus

In Alaska, the Pacific walrus ranges from the southeastern Bering Sea to occasionally the western Beaufort Sea. Most of the 270,000 to 290,000 individuals censused in 1980 migrate north and south with the seasonal pack ice. Most spend the winter in the Bering Sea, especially west and southwest of St. Lawrence Island and in the Bristol Bay area. Mating occurs from January to March in the primary wintering areas. Calves are born in the northern Bering Sea during spring migration. Males primarily remain in the Bering Sea in summer, especially at several sites in Bristol Bay and St. Matthew Island. Over 100,000 walruses, primarily females with calves, summer in the Chukchi Sea, especially in the area from Bering Strait to Wrangel Island and in the northeastern Chukchi Sea. Recent trends in the walrus population suggest that it may experience a decline in the foreseeable future.

Past, ongoing and projected non-OCS activities, and past and ongoing OCS activities that could produce important adverse impacts on Pacific walrus include oil and gas development on current federal leases in the Beaufort, Chukchi and Bering Seas; commercial fishing operations; subsistence harvest; and disturbance from operation of aircraft, vessels, vehicles, construction, and other human activities in areas where walruses are engaged in activities that make them especially vulnerable. Production and transportation of oil is likely to cause the greatest increase in impact. The effect of commercial fishing activities on prey populations used by walruses probably is not significant. However, there is evidence of possible depletion of benthic food resources used by the walrus, caused perhaps by the current high population level itself. The current subsistence harvest apparently is substantial but its effect on the population is not known.

Oil spills are not likely to have a fatal effect on adult walruses, since a thick layer of fat provides their insulation. But eye and skin irritation with possible infection, and inhalation of hydrocarbon vapors, could interfere with breeding behavior and foraging and may reduce survival in already stressed adults and young. Oil is more likely to cause mortality in newborn calves. Although multiple oil spills, as well as disturbance associated with development activities, conceivably could disrupt walrus breeding activity and ultimately result in decreased productivity, it does not appear likely that either would occur in winter over a significant proportion of the two primary areas where mating takes place. Exposure of migrating herds of females and calves to multiple spills is much more probable since their migration route traverses portions of the Navarin Basin, St. George Basin and Chukchi Sea Planning areas it is likely that oil would contact the walruses from existing oil and gas activities. Nevertheless, potential effects under these circumstances are not expected to exceed moderate since contact probably would involve perhaps several hundred to a few thousand walruses, and effects on most individuals is likely to be sublethal. Elsewhere, and in other seasons, the walrus population is widely dispersed, so contact with an oil spill may effect only a few individuals resulting in a low impact to the overall population.

Helicopter traffic between shorebases and drilling rigs or platforms would be the primary source of disturbance to walruses. Although this type of disturbance would be brief, the impact on individual walruses, particularly calves, could be severe. Because the walrus nursery-herds are widely distributed along the ice front and lead systems during spring and summer, helicopter flights are not likely to disturb a major proportion of the walrus population. However, injury or death of small numbers of walrus calves is possible. Vessels supporting drilling activities would



be present primarily in the open-water season from the central Bering Sea northward. These vessels would follow the retreating ice front in May and June, using the primary lead system in the Chukchi Sea. Such traffic may coincide with walrus using the same general lead system or route, and temporarily interfere with local movements or displace hauled out individuals. However, there is no evidence that vessel traffic would block or significantly delay walrus migrations or result in greater than low level impacts on their migration or distribution. Oil-spill cleanup activities, like other human activities, would displace walrus temporarily from the vicinity for the duration of the activity.

The walrus' migratory habits could expose the population to adverse factors associated with oil and gas development in several planning areas included in the current and future 5-year programs (Beaufort Sea, Chukchi Sea, Hope Basin, Norton Sound, Navarin Basin and St. George Basin). The estimated mean number of oil spills from all sources for this area 29 (Table IV.B.4-2). It is assumed, based on an uniform distribution of oil spills, that multiple oil spills would contact various segments of the population in the same year or sequentially, over the life of the current or future 5-year programs. Multiple spills repeatedly contacting migrating or summering herds of females with calves would cause sufficient mortality among the offspring of this slowly-reproducing species to require at least one generation for recovery, a moderate level of impact. With the addition of disturbance impacts associated with oil and gas development in current and future 5-year programs, such as increased physiological stress levels, could increase the potential oil-spill impacts described above; however, none are likely to be sufficiently adverse to elevate the impact of oil spills plus disturbance above that for oil spills alone.

**CONCLUSION:** The cumulative impact on the Pacific walrus is expected to be moderate.

#### (7) Other Pinnipeds

##### (a) Northern Elephant Seal

Prior to the commercial harvesting of the 1800's, the range of the northern elephant seal, extended from Point Reyes, California, to Cabo San Lazaro, Mexico. The species was thought to be extinct until 1892, when a small population of no more than 100 animals was discovered on Isla de Guadalupe, off Baja California. The present breeding range of the northern elephant seal extends from Isla Natividad in Baja California to Point Reyes in northern California (Bonnell et al., 1983; Allen et al., in press). The population size is estimated at 100,000 (DOC, 1987). Cooper and Stewart (1983) estimate that the population has been doubling every year since the early 1960's.

Like the California sea lion, elephant seals appear to be little affected by anything taking place in their environment. As with sea lions, elephant seals are most vulnerable to disturbances at the island rookeries. And since most of the islands are protected (especially in the United States), these animals experience few disturbances on rookeries. When not on the rookery, these animals are totally pelagic and feed at depths of 350 to 650 meters (.2 to .4 miles) with only 14 percent of their time spent on the surface (Le Boeuf et al., 1987). This makes them less vulnerable to most potentially impacting agents (i.e., vessel traffic, gillnetting).

The impact of an oil spill on these animals would come primarily from the cleanup attempt. In the Pacific Region, the most densely populated rookeries occur on San Miguel, Ano Nuevo, and San Nicholas Islands. (Outside of the Region, the most densely populated are Isla de Guadalupe and Isla San Benito off Baja California.) Once on the rookery, these animals fast for the entire period (unlike female sea lions) and, therefore, generally do not leave the island. However, any cleanup effort near, but especially on, the island may cause animals to stampede to the ocean. These animals have evolved physiological and behavioral mechanisms that allow them to remain on the island which facilitates caring for young and maintaining a social

hierarchy. Repeated disturbance of the rookery could lead to: (1) a total breakdown of the social structure which would lead to reduced pupping, (2) an excessive expenditure of energy of a fasting animal which could cause them to be susceptible to other decimating factors, (3) the separation of pups from cows (which generally leads to death), and/or (4) the death of pups by stampeding adults. Depending on the number of disturbances, these factors could all lead to a reduced reproductive effort for the season.

Multiple large oil spills occurring and contacting a major rookery from existing oil and gas activities more frequently than 4-6 years or contacting two major rookeries in the same breeding season could elevate impacts one or more levels. However, based on oil-spill assumptions for this analysis, it is assumed that oil spills will not contact rookeries during the breeding season in the same year. Therefore, impacts from oil spills are expected to be very low.

For reasons discussed above, the only impacting agent that could substantively affect elephant seals would be a major oil spill contacting one of the important rookeries during the pupping season. Assuming that the increased number of oil spills from the addition of the current and future 5-year programs (especially in the northern Channel Islands of the Southern California Planning Area) means additional oil spills impacting different islands (as opposed to impacting the same island), the level of impact is not expected to exceed levels associated with past, ongoing and projected non-OCS activities, and past and ongoing OCS activities.

**CONCLUSION:** The cumulative impact from OCS and non-OCS activities in the range of northern elephant seals is expected to be very low.

#### (b) Harbor Seal

Along the west coast of North America, the range of the harbor seal extends from Alaska south to Baja California. The harbor seal is a year-round resident along the coast of the Alaska and Pacific Regions, hauling out on islands, estuaries, secluded beaches, and offshore rocks along the length of the coastline (Bonnell et al., 1983; Hanan et al., 1988). The most recent estimate of the population size is 320,000 animals, of which 42,000 (13 percent) are found south of Alaska (DOC, 1987).

Based on censuses performed from 1982-1986, the harbor seal population in California appears to be stable. The NMFS estimates that the population in Oregon has increased by 7 percent annually since 1977 and about 10 percent annually in Washington since 1976 (DOC, 1986).

The status of the species in Alaska is less clear, however. Hoover (1988) presents a discussion on the problems of obtaining quantitative data on seals in Alaska and summarizes information on the population trends. In summary, it appears that the populations along the northern Alaskan Peninsula (Hope Basin Planning Area) and on Tugidak Island (in Kodiak Planning Area) are declining. The population in the Gulf of Alaska is believed to be increasing. Populations elsewhere are presumed to be stable.

Impacts to harbor seals are essentially the same as those already discussed for the harbor porpoise and the California sea lion. These include gillnetting, nearshore pollution, and noise from vessel traffic. Additionally, a detailed discussion of impacting agents and their possible impacts on harbor seals, especially in Alaska, is presented in Hoover (1988).

One factor that had an impact on harbor seals in the recent past was the harvesting of seals. From California to Alaska, bounties were paid on harbor seals by state and territorial governments to reduce conflicts with commercial fishing. Outside of Alaska, the majority of the bounty records are from 1910 to 1964 (where tens of thousands were killed in each state) until numbers became too low to make bounty hunting profitable (Boveng 1988). In Alaska hunting continued until passage of the Marine Mammal Protection Act in 1972.



The actual impact of this past exploitation on the current population dynamics is unclear. One might suspect that increases in seal numbers outside of Alaska may represent recovery from levels reduced by exploitation; but this is not directly supported by census data. As for Alaska, population models based on seal numbers and harvest data for Tugidak Island (where over 90 percent of the pups were killed annually between 1964-1972) indicate that most harvest declines should have ended by 1974; however, the population still appears to be declining (Calkins and Pitcher 1982 as cited in Hoover 1988). These data illustrate the difficulty in assessing increases or declines in seal populations which may reflect seasonal or annual variation in movements and distribution.

However, as the population of seals in the Pacific Region are either stable or increasing, it is estimated that impacts from past, and ongoing OCS and non-OCS activities are negligible to low. In the Alaska Region, some unknown existing factor appears to be the cause of continued population decline in certain areas, while other areas are stable or increasing. Except in areas of local declines, it is estimated that the impacts from these are negligible to low in the Alaskan Region. For those local populations that are small or have declined substantially in recent years for unknown reasons (not related to OCS oil and gas development), cumulative impacts could be moderate to high. However, the loss of these few individual would not elevate the overall impacts currently being experienced by the stable or increasing regional populations.

The concern over the effect of oil fouling on newborn phocid pups was discussed by St. Aubin (1988). Many newborn phocids are born with little subcutaneous fat and are thought to rely on their lanugo, or birth coat, for insulation. Harbor seal pups, however, are not born with lanugo, but rather with an adult-type coat which they keep for their first year. Yet, these animals are able to survive rigorous Arctic and sub-arctic conditions even when their coat is wetted by amniotic fluid at birth. Therefore, they must be able to utilize some fat stores to compensate for their coats. However, it is unknown what the actual effect of oil fouling has on phocid pup seals ability to thermoregulate prior to establishing an adequate blubber layer. Although oiling may not cause outright death through hypothermia, it may lead to death from increased thermal stress in these young animals.

As with the other pinnipeds previously discussed, it is estimated that due to their lower vulnerability to spilled oil (except in cases where an oil spill contacts a rookery in the breeding season) harbor seals would experience very low impacts from oil spills. Therefore, the overall impact to harbor seals is expected to be very low.

The normal activities associated with the current and future 5-year programs that may impact harbor seals include the drilling of exploratory, and development wells, vessel traffic from supply and crew boat bases to drilling rigs or platforms, and helicopter traffic. The additive or synergistic impacts of these activities, combined with other proposed and existing projects and activities, is expected to increase the amount of noise and disturbance on harbor seals in the Alaska and Pacific Regions. This incremental addition is not expected to increase the very low impact that may result from past, ongoing and projected non-OCS activities, and past and ongoing OCS activities.

The only significant potential impacting agent associated with the current and future 5-year programs that could affect harbor seals would be a major oil spill contacting one of the important rookeries during the pupping season, as stated above. If multiple large oil spills occurred and contacted a major rookery more frequently than 4-6 years or contacted two major rookeries in the same breeding season, it could elevate impacts one or more levels. For those local populations which are small or have declined in recent years impacts could be moderate to high. However, the loss of these few individuals would not elevate the low impact to the regionally stable or increasing harbor seal populations. Based on an uniform frequency of oil spills over the 35-year life of the program, it is assumed that oil spills would contact different

areas or islands (as opposed to impacting the same area or island). Therefore, the impact to harbor seals is expected to be low.

**CONCLUSION:** The cumulative impact from OCS and non-OCS activities on harbor seals is expected to be low.

#### d. Polar Bear

Polar bears in Alaska apparently belong to two populations, Beaufort Sea and Chukchi Sea, with some interchange between the two areas confirmed by radiotelemetry studies. The current estimate for the total Alaskan population is 3,000 to 5,000. They are most abundant in drifting pack ice in winter, near the pack ice edge in summer, and along new ice and leads in fall.

Past and ongoing OCS and non-OCS activities that could produce adverse effects on polar bears include oil and gas development on current federal leases in the northern Bering, Chukchi and Beaufort Seas; current and future state oil and gas production; oil and gas development on the ANWR; Canadian Beaufort development and production; Red Dog Mine; and subsistence harvest. Altered prey availability also could affect polar bear distribution and abundance.

Although polar bears are very sensitive to oil contact (Englehardt, 1981; Geraci and St. Aubin, 1988; Oristand et al., 1981), their low population density over much of the arctic during a substantial proportion of the year, solitary habits, and ability to forage out of water suggest that relatively few would be contacted by a spill occurring where density is low, and thus potential oil spill effects on their regional population in such cases are likely to be low.

Where densities are much higher, such as at the southern pack ice edge, in areas of new ice, and along leads, an oil spill potentially could contact substantially greater numbers of bears, resulting in at least a moderate level of impact. In particular, a relatively large proportion of bears in such habitats may be breeding females whose mortality would constitute a more important loss to the population than that of males.

Taylor et al. (1987) indicate that the population can sustain a 1.6 percent loss of females, or perhaps 32 individuals in a population of 2,000. If this number is exceeded by the subsistence harvest, mortality resulting from an oil spill could delay population recovery for several years and represent a moderate impact. Likewise, the number of bears affected indirectly through local reduction of seals or ingestion of oil by eating contaminated seals or cleaning oil from the pelage is likely to be small where bear density is low, but could increase in areas of elevated density. As a result of rapid westerly movement of ice or water, oil spills may be carried substantial distances in the Beaufort Sea and potentially affect greater numbers of individuals.

Disturbance from noise and human activity (including aircraft operation, operation of vehicles and other activities associated with seismic surveys, vessel operation, construction of offshore causeways and gravel islands, construction and operation of offshore platforms and onshore facilities, and subsistence hunting) could displace polar bears from within several kilometers of where these activities are localized. Such changes are likely to last for the duration of the activity. Likewise, displacement of ringed and bearded seals from these areas could result in corresponding changes in polar bear distribution. However, since the density of polar bears throughout most of their range is extremely low, and the amount of displacement and change in habitat use is likely to be relatively small in comparison to the natural variability in seasonal habitat use, overall disturbance effects are expected to be low.

The most serious consequence of disturbance may be the displacement of pregnant females from preferred denning areas. Although the effects of current development on polar bear denning are not known, dens typically are more sparsely distributed along the Alaskan coast



than in other parts of the range so effects probably would not exceed a low level. Nor is the coastal facility associated with Red Dog Mine likely to have a significant effect. Polar bears also may be attracted to sites of human activity in their search for food, potentially resulting in removal of individual bears from the population. Currently, only natives are allowed to take polar bears in Alaska; this take is essentially without restriction, although an agreement among native groups may result in lowered harvest mortality in the Beaufort region. Reported take from 1980-1985 averaged 135 bears per year; this may represent approximately 21 percent of total mortality (Amstrup and DeMaster, 1988), and is many times the number of bears likely to be affected by oil spill or disturbance factors.

Although extensive annual movements of polar bears have been documented within the two regional population ranges, they do not appear likely to travel through, and thus be exposed to, oil spills in more than two or three planning areas in this time frame. With the addition of the current and future 5-year program 25 spills in the areas where polar bears range: Beaufort and Chukchi Seas, and Hope, Norton and Navarin Basins. However, only 10 of these are projected for the primary range north of the Bering Strait, the remainder occurring further south where polar bear numbers are extremely low. In low density portions of their range, it appears likely that polar bears would experience only low effects from oil spills. However, the potential for multiple spills that could contact various segments of the population in the same year or sequentially, over the life of the current or future 5-year programs, exists and could result in a higher impact level, especially with repeated contacts in higher density areas as discussed above. It does not appear likely that disturbance from noise and human activity associated with oil and gas development in these planning areas would displace significantly more bears than that from current leases and other activity, or to be sufficiently adverse to elevate the aggregate impact of oil spills plus disturbance above that for oil spills alone.

**CONCLUSION:** The overall cumulative impact on the polar bear is expected to be moderate.

## **2. Marine and Coastal Birds**

### **a. Threatened or Endangered Birds**

#### **(1) Arctic and American Peregrine Falcon**

The U.S. Fish and Wildlife Service estimates that 200 pairs of arctic and 400 pairs of American peregrine falcons historically nested in Alaska. Beginning in the late 1940's, the use of the organochlorine pesticides greatly affected peregrine falcons, causing birds to lay thin-shelled eggs which often failed to hatch and consequently lowered reproduction. In Alaska, the population of arctic peregrine falcons declined to approximately 30 percent of historical levels. In 1978, a number of years after the U.S. had restricted the use of organochlorine pesticides, the peregrine falcon population began to increase. Based on 1988 surveys, the population of arctic peregrine falcons now stands at about 80 pairs and 120 young. The population of American peregrine falcons is estimated at about 225 pairs in Alaska and about 64 pairs in California. The current trend for both subspecies is for gradually increasing numbers (DOI, FWS, 1989; Ambrose, pers. commun., 1989).

There are a limited number of the OCS and non-OCS projects or proposals that could affect peregrine falcons. However, any noisy activity or large-scale habitat alteration near nesting sites and locations are the types of actions that would adversely affect peregrine falcons.

Two existing projects or proposals that may affect arctic peregrine falcons would be offshore mining in Alaskan waters near Nome, and the OCS Mining Program Norton Sound Lease Sale. Potential impacts as a result of these two projects would be related to the mining and processing of the ore. As a result of these activities, mercury concentrations in the water column may be increased. Mercury can readily bioaccumulate and biomagnify within the marine food chain and eventually result in reduced reproductive success in birds.

Several pairs of arctic peregrine falcons nest on coastline cliffs in the area and feed on resident seabirds. Consequently, mercury may impact seabird reproduction and eventually result in the reduction of prey availability for the falcons. It may also accumulate at high levels in the peregrine falcons and cause direct mortality or accompanying reduced reproductive success. The effect of mercury on peregrine falcons may result in the loss of some or all of the six nesting pairs near the Proposed Norton Sound Lease Sale Area, and is expected to result in a moderate level impact on the northwest Alaska coastal arctic peregrine falcon population (approximately 20 to 30 pairs) (DOI, MMS, 1988).

Oil spills and noise as a result of previous Federal and State oil and gas lease sales have the potential to affect peregrine falcons. Peregrine falcons feed principally on birds, preferring to take their prey in flight. Consequently, it is unlikely that spilled oil would contact the falcons directly. However, it is possible that peregrines could be oiled while feeding on partially oiled seabirds, waterfowl, or shorebirds. Also, peregrines would be affected by a reduction in prey availability, if a large number of birds in the area are contacted by spilled oil and die.

Nesting peregrine falcons could be disturbed by the noise of helicopters passing low overhead between support bases and exploration units or production platforms. This disturbance could possibly result in abandonment of nest sites, nestling mortality, and reduced reproductive rates.

The use of persistent pesticides even in reduced quantities has resulted in continued contamination in the peregrine falcon. The ban of DDT and related pesticides in the United States has greatly reduced the bioaccumulation of these chemicals in peregrine falcons, thereby it has reduced reproductive failures. However, the continued use of persistent pesticides (including DDT) in the Third World Countries of Central and South America where peregrines winter and migrate, has resulted in a persistence of contamination in peregrine falcons.

Habitat destruction can also adversely affect peregrine falcons. Large-scale habitat destruction in Central and South America (clearing of forests for agriculture). Commercial and residential construction in coastal areas could result in less suitable habitat and prey for peregrine falcons which could result in a lower reproductive rate. Destruction of wetlands along migration routes and within feeding territories also can reduce the prey base and slow the recovery of the falcon species.

The impacts to the peregrine falcons as a result of the activities associated with the current and future 5-year programs would be similar in nature to those previously described. Slightly higher impact levels may be estimated from increased levels of noise and disturbance from helicopter operations associated with the increased levels of exploration and production anticipated.

The development and production scenario for the Chukchi Sea Planning Area (DOI, MMS, 1985) anticipates construction of an onshore pipeline from Point Belcher to the Trans-Alaska Pipeline (see Section IV.C.). At this time only a hypothetical corridor has been identified; however, it appears that the pipeline has the potential to pass in close proximity to a number of peregrine falcon nesting sites. Should this activity occur, it has the potential to disturb a number of nesting pairs and may lead to abandonment of nest sites, nestling mortality, and a reduced rate of reproduction.

The combined impacts from a variety of impacting agents may result in the death of a low number of peregrine falcons, the short- or long-term abandonment of some nest sites, and the likelihood of a reduced reproductive rate. Bioaccumulation of trace metals such as mercury resuspended by offshore mining programs may result in the direct mortality of a few peregrine falcons or in reduced reproduction in those coastal-nesting pairs near the mining area. Noise and disturbance from helicopter operations associated with OCS and non-OCS activities may



result in the abandonment of nest sites, which could possibly cause nestling mortality and thereby, a reduced reproductive rate. Continued use of persistent pesticides and habitat disturbance or destruction along migration routes and in wintering areas would likely have sublethal impacts that may result in reducing reproductive rates and slowing the recovery of the species. The most obvious effects (potential mortality and noise disturbance of nesting birds) would be generally limited to coastal-nesting pairs which comprise a small portion of the peregrine falcon population. It is expected that overall cumulative impacts from non-OCS and OCS activities on peregrine falcons would be low.

**CONCLUSION:** Since only a small portion of the peregrine falcon population, in Alaska and California, is likely to be affected by the activities of the current and future 5-year programs, the overall cumulative impacts are expected to be low.

## (2) Short-tailed Albatross

The short-tailed albatross was once abundant and widespread in the North Pacific, including coastal areas from Alaska to Baja California where upwellings brought nutrient-rich waters to the surface. Historically, it was probably the most abundant albatross in Alaska waters and is reported to have numbered in the low millions (Hasegawa and DeGange, 1982). By the 1930's, following 50 years of exploitation for their feathers and oil, the species was reduced to fewer than 100 birds. The species has been protected by the Japanese government since 1933, and numbers have slowly increased to a current population of about 400 birds. Through continued protection and habitat improvement efforts on the breeding grounds, the population is continuing to increase.

Existing projects or proposals that could affect the short-tailed albatross would include commercial and subsistence fishing, ingestion of waste material, and previous State and Federal oil and gas lease sales.

The short-tailed albatross is a surface-feeder, and is believed to feed nocturnally on squid, (Hasegawa and DeGange, 1982). Short-tailed albatrosses are also known to follow marine vessels and will sometimes consume discarded offal. This behavior indicates that individuals could become entangled in fish nets (including active, discarded, or lost gear) or caught on hooks in trolled or long-line gear. Two dead short-tailed albatrosses have been recovered by commercial fishermen in the last six years, one from a net and one from a long line (Amaral, pers. commun., 1989). The fishing industry may also compete with albatrosses for prey species such as walleye pollock and sablefish, which have larval or juvenile stages that occur at or near the surface. Lastly, albatrosses could be harmed or die by contacting petroleum products leaked or spilled by vessels in the commercial fishing fleet.

Albatrosses could suffer injury or mortality from the ingestion or entanglement with plastics or other debris disposed of overboard. Section IV.C. contains a brief description of the magnitude of waste materials lost or disposed of at sea. Albatrosses were among those seabirds observed to ingest plastics most frequently (Day et al., 1985). Ingestion of plastics can result in intestinal blockage and lesions. Plastic particles have been found among food items brought by adult short-tailed albatrosses to feed developing chicks. It appears that plastic pollution is a growing threat to the species (Hasegawa, pers. commun., 1988).

The impacts from, existing oil and gas exploration, development and production from previous State or Federal lease sales on short-tailed albatrosses would be similar to those previously mentioned (impacts of spilled oil and the disposal of waste materials). The Consolidated Offshore Operating Regulations (30 CFR 250) which govern oil and gas activities on the Federal OCS prohibit the disposal of solid wastes and other materials at sea, and should help to mitigate the problem of discarded plastic wastes.

Even with the activities associated with the current and future 5-year programs, the impacts are estimated to be similar in nature to those previously discussed. However, a greater number of oil spills would be estimated to occur. The mean estimated number of oil spills within the broad oceanic range of the short-tailed albatross from all sources over the next 35- to 40-year period would be about 62 oil spills (see Table IV.B.4-2). If individual albatrosses contacted spilled oil they would probably die. But, it is unlikely that very many individuals would contact spilled oil since the 400 individuals in the population are presumably well scattered over much of the North Pacific and Bering Sea during the non-breeding season from May to November. As the population continues to grow, of course, the probability of one or more birds contacting an oil spill will gradually increase. Therefore, the cumulative impacts on the short-tailed albatross are estimated to be low.

**CONCLUSION:** The cumulative impacts on the short-tailed albatross are expected to be low.

### (3) California Least Tern

Once California least tern's nesting habitat (sandy ocean beaches) was fairly common. However, increased human activity has made these areas largely uninhabitable, breeding, therefore, occurs on some 20 isolated coastal areas. The majority of the breeding sites are located in southern California on military bases (Seal Beach Weapons Station and Camp Pendleton). The FWS estimated that from 1974 to 1977 the least tern's population ranged from about 580 to 770 breeding pairs and from 1984 to 1987 from 940 to 1,020 breeding pairs. However, since these birds once numbered in the tens of thousands along the central California coast to northern Baja, these figures still represent a depressed population.

The most significant impacting agent affecting least terns is the destruction of nesting and feeding habitat due to the development of the southern and central California coastline. (See Section IV.C for discussion of loss of coastal habitat in California.) Coastal highway construction, recreational development, and construction of beach cottages have reduced habitat and permitted increased human access to least tern nesting beaches. Feeding areas have been filled in, developed, and polluted. The continued loss of shoreside nesting and feeding habitat, along with high levels of human disturbance and predation by coyotes, foxes, and domestic animals at the remaining colonies, have been responsible for the dramatic decline in numbers. It is unknown what impacts the least terns are experiencing in Mexican waters during the nonbreeding season. Assuming no more habitat is destroyed as projected in the FWS recovery plan, and human disturbance and predation remain at the current level, it is estimated that these impacting agents would have a moderate level of impact on this species.

Like most avian species, least terns are vulnerable to oil spills (see discussion in Section IV.A.4.c.6 in the FEIS). Since least terns seasonally breed in about 10 widely-spaced locations (in some 20 colonies) from Morro Bay to the Mexican border (DOI, FWS, 1980), an oil spill would have to occur and contact the birds while they are present at this sites (from May-September) to cause impacts to the species. If an oil spill should occur and contact a breeding colony, it is assumed that adult and/or chick mortality would result. Based on the proximity of the existing level of oil and gas activities in southern California to the location of the colonies and the estimated mean number of oil spills (7) (see Table IV.B.4-2), it is assumed that an oil spill would contact the breeding locations or colonies during the breeding season. Therefore, impacts levels would be elevated to high. The duration of the impact would be expected for 2 to 3 generations.

The primary consequence as a result of the activities associated with the current and future 5-year programs is the increased risk of an oil spill occurring and contacting habitat in the Southern California Planning Area. The estimated mean number of oil spills from all oil and gas activities increased to 12 (Table IV.B.4-2) over the next 35 years in the Southern California



**Planning Area.** Based on an uniform distribution of these 12 oil spills over the next 35 years, it is assumed that at least one spill would occur and contact least tern habitat during the breeding season. If an oil spill should occur and contact the breeding habitat when least terns are present, impacts are expected to be high, since the expected mortality to this population which is in danger of becoming extinct and it would take about 2 generations (6-9) years to recover from the impacts. If a second spill occurred and contacted the breeding habitat when least terns are present within 6 to 9 years of a previous oil spill which contacted while the least terns are present, impacts are expected to be elevated one level to very high. However, if the second oil spill occurred and contacted the area more than nine years after the first oil spill it is not expected to elevate the level of impact to the species, since sufficient time will elapse to allow recovery from the first spill. However, it is highly unlikely that two oil spills would contact the same breeding habitat while the least terns are present. Therefore, it is assumed that only one spill would occur and contact the breeding habitat within nine years.

Impacts are expected to remain at the high level expected without the current and future 5-year programs. The increased risk of large oil spills from the current and future 5-year programs is not great enough to change the assumptions about oil contacting nesting habitat when least terns are present. However, as indicated previously, the expected level of impact would increase to very high if nesting least terns were oiled during two breeding seasons within a 6-9 year period.

Impacts from onshore oil and gas facilities could result in the loss of important habitat, currently this is unlikely as extensive mitigation is required to prevent such losses on all existing projects. Therefore, impacts from this source is expected to be negligible.

**CONCLUSION:** The cumulative impacts from all OCS and non-OCS activities within the range of the California least tern are expected to be high.

#### (4) California Brown Pelicans

The history of the California brown pelican's decline due to the bioaccumulation of chlorinated hydrocarbons (DDT, DDE, dieldrin, and endrin) in the food chain and scarcity of food (i.e., anchovies) is well documented in the literature (see Section III.A.3.a). After the dumping of chlorinated hydrocarbons into the Southern California Bight was terminated in the early 1970's, pelican reproduction began to improve (Anderson et al., 1975).

Pelicans are now successfully breeding on both Anacapa and Santa Barbara Islands in the Channel Islands National Park. But, during the past few breeding seasons the Pelicans in the Coronados colonies (in Mexico) have not been breeding successfully.

Briggs et al. (1983) observed approximately 24,000 post-breeding birds ashore and at sea in northern and central California in July of 1980 and 1982 and 33,000 in 1981. In 1983, Briggs et al. estimated the total California populations as high as 80,000 to 110,000.

Post-breeding brown pelicans are very tolerant of moderate human activity, especially on daytime roost (Jacques and Anderson, 1987). Pelicans are a common sight in harbors and wharfs all along the coast following the breeding season. Indications are that these post-breeding birds can habituate to low level, chronic disturbances. Breeding birds and birds on nighttime roost, however, are much more sensitive (Anderson, 1988; Jacques and Anderson, 1987).

Since the breeding colonies are protected in the U.S. (on Anacapa and Santa Barbara Islands), the major impacts from human disturbances occurs to the post-breeding pelicans at nighttime roosting areas. In the Southern California Bight, San Miguel, and Santa Cruz Islands are the most important roosting areas. There is a lack of undisturbed nearshore roosting habitat in the

Southern California Bight, with the Long Beach breakwater being the only nearshore roost in the area. However, in northern and central California (and presumably in Oregon and Washington), there are more offshore rocks and, therefore, more undisturbed roosting habitat. As yet, the availability of roosting habitat does not appear to be limiting pelican numbers. Impacts from human disturbances appear to have only sublethal impacts on this species.

The major potential impacting agent to brown pelicans would occur in the event of a large oil spill contacting breeding and/or roosting habitat. However, significant oil spill impacts have not occurred as a result of past oil spills. No pelicans were reported oiled in the 1969 Santa Barbara oil spill. Only twenty-five juvenile pelicans were oiled as a result of the 1973 oil spill from the Navy vessel *Manatee* which contacted the shoreline from San Clemente to the Mexican border (DOI, FWS, 1983). This oil spill occurred during late summer when a large number of birds were dispersed throughout the area. Nero and Associates (1982) reported that juvenile pelicans made contact with oil more than adults, which suggest adults may learn to avoid oil. Nevertheless, it is assumed that a major oil spill located near a large colony, feeding area, or roost would contact a large numbers of birds.

If a large oil spill occurred and contacted the following areas, impacts to brown pelicans are expected to result in a population decline that would last about 3-5 years: 1) Anacapa or Santa Barbara Island during the breeding season (i.e., January to March); 2) San Miguel Island, Santa Cruz Island, the southeast Farallon Islands, or the Long Beach breakwater during the post breeding season (May to November); and 3) the major offshore feeding areas near Point Arguello, Point Conception and Point Arena during the post breeding season.

Based on the estimated mean number of oil spills (7) for the Pacific Region from existing oil and gas activities and for the purpose of this analysis, it was assumed that a large oil spill would contact at least one of these areas during a sensitive season over a 35 year period. Based on that assumption, impacts are estimated to be moderate for brown pelicans. However, if a large oil spill contacted one of these areas twice within 3-5 years (i.e., 1 generation) or more than one of these areas in the same year, impacts would be high.

Since other impacting agents do not appear to have lethal impacts on pelicans, the primary consequence from the addition of the activities associated with the current and future 5-year programs is the increased risk of an oil spill occurring and contacting habitat in the Northern, Central, and/or the Southern California Planning Areas (and to a lesser extent the Oregon and Washington Planning Area). The expected mean number of spills increased from 7 (from existing oil and gas activity) to 12 with the inclusion of activities from the current and future 5-year programs in the Southern California Planning Area; in Central California Planning Area it increased from 3 to 4; in Northern California Planning Area it remained the same at 1 (See Table IV.B.4-2).

It was assumed that the additional oil spills translate into different areas being contacted (as opposed to the same area being contacted, again). Therefore, the additional oil spills increases the likelihood that another sensitive pelican area (see above discussion) could be contacted within 3-5 years of the first assumed contact. It was assumed that the estimated oil spills would occur with uniform frequency during a 35-year period. Although it is likely that 2 oil spills could occur within a 3- to 5-year period, it is unlikely that it would contact these widely separated areas within the 3- to 5-year period. Therefore, these additional oil spills are not estimated to raise the level of impacts above moderate. However, in the unlikely chance as discussed above, impacts could be high if multiple oil spills contact more than one sensitive area in the same year or the same area within 3-5 years.

**CONCLUSION:** The overall cumulative impacts to brown pelicans are expected to be moderate.



## **(5) Bald Eagle**

### **(a) Alaska Region**

An estimated 30,000 bald eagles (20,000 adult and near-adult, 10,000 immatures) occupy coastal areas in Alaska (Schempf, 1987; 1989, per. comm.). Greatest concentrations of adult/near adult birds are found in southeast Alaska (12,000+); northern Gulf of Alaska, especially Prince William Sound (2600+); and the Kodiak Island-Alaska Peninsula area (2500+). Approximately 30 percent may nest successfully in a given year (Hodges, 1982), but the proportion of adults not breeding is highly variable (e.g., ranging from 16% to 86% in southeast Alaska in the 1970's), as is annual productivity (e.g., 0.19 to 0.93 fledglings per nest in the Chilkat Valley, 1980-83), both within and between various areas in the state (Hansen, 1987; Hansen and Hodges, 1985; Hansen, et al., 1986). Recent surveys suggest that the bald eagle population in Alaska is relatively stable with increasing numbers of adults balanced by a decrease in productivity. Although many adults remain in the vicinity of their nesting areas throughout the year, substantial numbers migrate hundreds of miles to areas of food concentration and/or milder winter conditions (Alaska Dept. Fish & Game, 1986). The bald eagle is currently unlisted in Alaska as a threatened or endangered species.

Cumulative factors with the potential for significant adverse impact on survivorship and/or productivity in the bald eagle population include disturbance prior to or during nesting, habitat degradation, illegal shooting, oil and gas development on federal and state leases, fuel spills, commercial fishing operations and other fishing harvests, and severe weather during nesting.

The most severe of these impacting agents, currently, which effect bald eagles are shooting and habitat loss. It is estimated that about 500 eagles nationwide are killed annually by illegal shooting. In the early 1960's, shooting was the cause of death for 60 percent of the dead eagles found; more recently the percentage has dropped to 18 percent. In Alaska some 128,000 bald eagles were killed for bounty between 1917 and 1959 until the Bald Eagle Protection Act was amended to include the State.

Disturbance may result from the presence of people, vehicles, boats or aircraft in the vicinity of a nest site. Disturbance prior to nesting may prevent a nest site from being occupied, while that occurring after nesting has been initiated may cause it to be abandoned. Nesting habitat degradation may result from timber harvests, land development, and destruction of nest trees or windthrow. Foraging habitat degradation may result from certain timber harvesting practices or oil spills. Excessive fish harvests, particularly of salmon, or degradation of fish habitat may cause a decline in food availability.

Currently there are no active offshore oil and gas leases in the vicinity of most bald eagle nest sites or wintering areas in Alaska. However, North Slope oil transported through the TAPS places at risk most of the Alaskan eagle population (i.e., Gulf of Alaska region) by exposing them to oil spills from tankers serving the pipeline. Oil spill impacts from tanker spills are more likely to result in more severe impacts than from a platform or pipeline spill due to the close proximity of tanker routes to nearshore areas and bald eagle habitat. A nearshore tanker spill could effect a large portion of the bald eagle habitat, thereby possibly impacting a larger number of bald eagles. The impact of most factors has not been quantified over a sufficiently large proportion of the range of bald eagles in Alaska to accurately assess the overall population-level effect. However, the level of general boating and other recreational activity; commercial, subsistence and sport fishing; commercial, residential and recreational land development; and timber harvesting in the Gulf of Alaska region is substantial. These factors, other than oil spills of tanker origin, that can disturb bald eagles or degrade bald eagle habitat can potentially cause decreased survival and/or productivity, and at least a low level of impact from these factors can be expected.

Studies following the *Exxon Valdez* oil spill in Prince William Sound have provided some evidence of the impacts that may result from a major oil release in this area. Potential impacts on bald eagles include hypothermia and/or impaired flight capability from direct contact with oil while foraging, impaired physiological function or death from oil ingested while feeding on oiled prey (adults or young), death of eggs or young from oil transferred from adults, abandonment of nest sites disturbed by oil spill cleanup activities, and reduction in available food. By late summer 1989, 146 dead bald eagles (including chicks) had been retrieved from oiled beaches (presumably a portion of these were birds dying of other causes and oiled secondarily). This probably represents only a fraction of actual mortality since a relatively small proportion of the shoreline affected by this spill was examined in sufficient detail to reveal carcasses (Alaska Dept. of Fish & Game, 1989). Preliminary results of post-spill nest surveys suggest that failure/abandonment of nests adjacent to heavily oiled beaches may have exceeded 80 percent (all causes—oiled adults, eggs and young; disturbance from cleanup activities; natural mortality), while failure in a nearby unoiled area was less than 30 percent (Schempf, per. comm., 1989). Considerable anecdotal evidence exists suggesting that cleanup activities in particular were extremely disturbing to nesting eagles. At present, it is not possible to determine if impacts of this and other recent oil spills on the eagle population would elevate the overall effect of all factors above the low level attributed to non-oil factors.

It is estimated that in the next 35 to 40 years, 7 tanker spills (i.e., assumed to be relatively high volume oil spills) could occur in association with the operation of the TAPS (Table IV.B.4-1) in the Gulf of Alaska where most of the Alaskan bald eagle population is concentrated. These oil spills thus represent a substantial risk to the eagle population since the tanker route passes through Prince William Sound and adjacent to southeast Alaska where a majority of Alaskan bald eagles reside. Based on information available from the recent *Exxon Valdez* oil spill, risk to the eagle population represented by this level of contamination and potential cleanup activity is speculative, but may be substantial. For example, if the dead eagles recovered during *Exxon Valdez* surveys represent only 10 percent of the total eagle mortality resulting from this incident, then the total (1460 in this example) could represent one year's mortality for the Alaskan population. Bald eagles have a low reproductive potential because of the species' late attainment of sexual maturity, small clutch size, and they may not find the opportunity to breed every year after reaching maturity. Thus, each of the 7 tanker spills noted above could also result in mortality equal to the annual mortality for the Alaskan population. Given that the distribution of these oil spills over time cannot be estimated, it is assumed for purposes of analysis that oil spills will occur uniformly over a 35- to 40-year period. As a result of these oil spills, the bald eagle population would probably require at least 3 to 5 years for recovery, a moderate impact. If large spills occur at a greater frequency (within 1 to 4 years of the first oil spill) the depressed population as a result of the first oil spill would not have fully recovered prior to the second oil spill, thereby, resulting in an increase in the level of impact.

The apparent stability of the bald eagle population in Alaska suggests that these non-oil factors are not now causing major impacts, although their overall effect may be obscured somewhat by the marked annual variability in proportion of adults breeding and reproductive success, both probably linked to availability of food. Implications of the effect of the *Exxon Valdez* oil spill on the stability of the population are being assessed.

With the addition of the current and future 5-year programs, nesting bald eagles could be disturbed by the noise of helicopters passing low overhead between support bases and exploration units or production platforms. This disturbance could possibly result in abandonment of nest sites, nestling mortality, and reduced reproductive rates. Habitat destruction due to the construction of support facilities could result in less suitable nesting/foraging habitat which also could result in a lower reproductive rate. The combined impacts from a variety of impacting agents, other than tanker spills, may result in the death of a



low number of individuals, short or long-term abandonment of some nest sites, and the likelihood of a reduced reproductive rate. It is expected that the overall combined cumulative impact from all these sources would be low.

With the addition of the current and future 5-year programs it is estimated that 13 oil spills from all sources could occur in the Gulf of Alaska subregion (Table IV.B.4-2). It is further estimated that approximately half of these spills would originate from tankers serving the TAPS (Table IV.B.4-1), and thus, represents a substantial risk to the eagle population, as discussed above. Two of the remaining spills also are tanker spills in area of eagle concentration (Shumagin Planning Area). Thus each of 9 spills could potentially cause mortality equal to the annual mortality for the Alaskan population. It is assumed for the purpose of this analysis that these spills would occur uniformly over a 40-year period. The remaining 3 potential spills of platform or pipeline origin are likely to release much smaller quantities of oil than the assumed tanker spills. Thus, it is reasonable to assume that, for any given location, spills from pipelines or platforms would contact fewer eagles than spills from tankers. This is due to the close proximity of the tanker routes to bald eagle habitat. Further, one of the platform/pipeline spill is expected to occur in the western Gulf of Alaska where fewer than 10 percent of the population resides. Given these factors, it is not expected that the number of eagles affected by the 3 assumed platform/pipeline spills would be substantially greater than the number affected by the 10 assumed tanker spills. Thus, it is expected that there would be little overall difference between impacts resulting from the 13 total spills assumed for the cumulative case and those resulting from the 10 assumed tanker spills. As a result of these oil spills, the bald eagle population would probably require at least 3 to 5 years for recovery, a moderate impact.

The estimates of activities and potential oil spills associated with the current and future 5-year programs suggest that development and production in the Gulf of Alaska subregion could increase in the future, while the overall impacts may not be elevated above the current moderate level as discussed above, their certainty of occurrence may increase.

**CONCLUSION:** The overall cumulative impact on the Alaskan bald eagle is expected to be moderate.

#### (b) Pacific Region

The number of breeding pairs in the Pacific Region are 309 in Washington; 166 in Oregon; and 83 in California. The status of the bald eagle has been a concern since the early part of the century. It is currently listed "threatened" in Washington and Oregon and "endangered" in California. The bald eagle population in the Pacific Region has increased. Eagles are occupying new habitats, more adults are surviving and recruitment into the population has increased (BLM, Northwest Bald Eagle Recovery Team, 1989, per comm). The USFW is reviewing the status of the bald eagle (50 CFR 4209, February, 7, 1990) in preparation of a proposal to either reclassify or delist the species. Bald eagles are still not common south of the Klamath Basin within the Northern California Planning Area.

Cumulative factors with the potential for significant adverse impact on bald eagle survivorship and/or productivity (See Section IV.D.2.a(5)(a)) include disturbance prior to or during nesting, habitat degradation, illegal shooting, oil and gas development on Federal and State leases, fuel spills, commercial fishing operations and other fishing harvests, and severe weather during nesting.

In the recent past, one of the more significant impacts to bald eagle populations was caused by the bioaccumulation of DDT (or its metabolite DDE). This disrupted calcium metabolism and resulted in the birds laying unusually thin eggshells which led to low egg survival. From 1947 to 1972 throughout the lower 48 states, eagle reproductive success dropped and remained at low levels until DDT was banned (Hickey and Anderson 1968). This species still is recovering from those previous lows (Grier 1982).

Currently, the most adverse of these impacting agents effecting bald eagles are shooting and habitat loss (See Section IV.D.2.a(5)(a)). It is estimated annually about 500 eagles nationwide are illegally shot.

Destruction of nesting habitat also has had adverse impacts on eagle numbers. Since eagles prefer nesting and wintering areas located near water, they often come in conflict with people. Destruction of nesting areas leads directly to decreased reproductive potential. The loss or destruction of wintering areas are not immediately obvious. As the result of being forced to use less favorable habitat or of poorer quality, eagles are more susceptible to adverse factors such as lack of food, and roosting sites, shootings, electrocution and injuries.

Grier (1980) showed that the population stability in bald eagles depended more on the survival rather than the reproductive rate. His modeling of a hypothetical eagle population showed that reductions in reproduction resulted in only small changes in the population. However, even smaller reductions in the survival rate of adults and sub-adults resulted in much larger reductions in the population. This is generally consistent with what has been observed in the wild as many eagle populations are slow to respond with increased numbers in spite of much improved nesting success. Therefore, it appears that the production of new eagles is secondary in importance to the need for the survival of the existing population (Stalmaster, 1987: 146).

The combined impacts from a variety of impacting agents, other than tanker spills, may result in the death of a low number of individuals, short or long-term abandonment of some nest sites, and the likelihood of a reduced reproductive rate. Due to the ban on the use of DDT, and the assumption that existing stipulations and legal requirements would be implemented, the potential impacts from these impacting agents over the next 35 to 40 years would be very low.

Currently, the Pacific Region, has no OCS oil and gas leases north of the Klamath Basin. However, tanker traffic as a result of North Slope oil transported through TAPS passes bald eagle concentrations in Puget Sound and northwest Pacific Coast exposing them to oil spills. A nearshore tanker spill could effect eagle habitat, thereby possibly impacting the bald eagle population. Based on information available from the recent *Exxon Valdez* oil spill, risk to the eagle population represented by this level of contamination and potential cleanup activity is speculative, but may be substantial (See discussion in Section IV.D.2.a(5)(a)). It is estimated that in the next 35 years, 2 tanker spills (ie., assumed to be relatively high volume oil spills) could occur in association with the operation of TAPS (See Table IV.B.4-1) in the Washington/Oregon Planning Area. Given that the destruction of these oil spills cannot be estimated it is assumed that for the purposes of analysis these spills would occur uniformly over a 35-year period. However, if large spills occur at a greater frequency (within 1 to 2 years of the first oil spill) the depressed population as a result of the first oil spill would not have fully recovered prior to the second oil spill, thereby, resulting in an increase in the level of impact.

These spills thus may represent a risk to the eagle population in the Washington/Oregon area. Because eagles have a low reproductive potential (i.e., late attainment of sexual maturity, a small clutch size, as well as not breeding every year) the addition of the 2 tanker spills from existing and projected TAPS activity could result in a population reduction requiring 1 to 3 years for recovery (a low impact).

The activities associated with the current and future 5-year programs that could have an impact on bald eagles includes noise of vessels and air traffic to and from supply bases, loss of habitat due onshore facilities, oil spills, and cleanup activities associated with oil spills. In the Pacific Region, it is assumed that through existing stipulations and legal requirements (e.g. Endangered Species Act), supply bases and onshore facilities would be located in areas where the potential impacts from these activities would have a very low to negligible impact on this species.



With the addition of the current and future 5-year program, it is estimated that a total of 4 oil spills could occur in the Washington/Oregon and Northern California Planning Areas (See Table IV.B.4-1) from OCS and non-OCS sources. It is estimated that 3 of these oil spills would originate from tankers (Table IV.B.4-1). The fourth, is a platform spill in the Northern California Planning Area. Given that the distribution of these oil spills cannot be estimated it is assumed for the purpose of analysis that these spills would occur uniformly over a 35-year period. However, if large spills occur at a greater frequency (with 1 to 2 years of the first oil spills) the depressed population as a result of the first oil spill would not have fully recovered prior to the second oil spill, thereby resulting in an increase in the level of impact. Thus, each of the 4 oil spills could potentially cause a reduction in the bald eagle population requiring at least 1 to 3 years for recovery, a low impact.

The addition of the activities and potential oil spills associated with the current and future 5-year programs, suggest that development and production could increase in the Washington/Oregon and Northern California Planning Areas in the future, while the overall impacts would not be elevated above the current low level as discussed above, their certainty of occurrence may increase.

**CONCLUSION:** The overall cumulative impact on the Pacific bald eagle population is expected to be low.

b. Nonendangered Birds

(1) Geese

(a) White-fronted Goose

The Yukon-Kuskokwim (Y-K) Delta white-fronted goose population recently has exhibited a modest increase after a decade of depressed numbers following a marked decline (85%) from high population levels in the 1960's. The current California winter population estimate (1988) is 161,500 (DOI, FWS, 1989). Probable factors responsible for these trends include climatic variables, subsistence and sport hunting, egg gathering, winter habitat availability/quality, and regulation of harvest activities.

On the delta breeding grounds, where 95 percent of the white-fronted goose population nests, important adverse factors include subsistence harvest of nesting geese and their eggs, and persistent ice and snowcover and/or flooding on nesting areas. Harvest in 1987 was 2,640 (71% of total harvest) and 221 (6%) in spring and early summer, respectively (Copp, 1987). Total harvest on the delta (3,722) was 2.8 percent of the winter population count. Only 110 white-fronted goose eggs were estimated to have been taken on the delta in 1987; it does represent an increase over the previous year of an activity which is prohibited by the Y-K Delta Goose Management Plan.

Current levels of disturbance resulting from aircraft, boats and human activity on the delta, and its effect on geese, are not quantified, but is likely to increase over the next several decades. These disturbances could potentially become a significant adverse factor, especially during the nesting and molting periods when the additional behavioral and energetic stress could cause increased breeding failure, declines in productivity, reduced survival of both adults and young, and delay of critical life-history phases. Potential human activities that could adversely affect goose habitat on the delta include large-scale reindeer husbandry, oil and gas or mineral development, and expansion of residential and recreational land use (DOI, FWS, 1989).

Potential impacts associated with oil and gas production, primarily contact with oil resulting from the oiling of intertidal mudflats, sloughs and meadows, are most likely to occur during the brood rearing, molting, and migration-staging periods (late June-August) when white-fronted

geese occupy these low elevation delta habitats. Impacts of oil on individual birds is discussed in DOI, MMS (1985b).

If an oil spill were to occur during this period, chances range from 10 to 100 percent that a substantial proportion of breeding adults and young could be contacted, thereby experiencing increased mortality and/or decreased recruitment for several years (Truett et al., 1984). Residual oil from an oil spill deposited outside this period also could result in substantial oiling of geese. Subsequent release of hydrocarbons in these relatively low-energy habitats could result in long-term adverse impacts. Most nesting occurs on habitats that are more elevated and further inland, and thus less vulnerable to oiling than those commonly occupied by several other goose species.

The source of an oil spill contacting this area is speculative since production from existing leases in Norton, Navarin, or St. George Basins is not anticipated in the near future, and the probability of oil spills from these areas reaching the delta is very low. Another potential activity representing a source of oil spills in this area is tankers passing through the Bering Strait enroute from Canadian Beaufort offshore oil production to Pacific Rim destinations. However, details on the tanker route remain unknown but would likely be quite far from the delta. A grounded fishing boat, fuel barge, or other vessel also could release hydrocarbons in this area.

Following the nesting period and molt, most white-fronted geese migrate without intermediate stops to the Klamath Basin (Oregon/California), especially that portion in northern California, and then to the Central Valley in California with small numbers continuing into central and coastal Mexico. A small proportion of the population (3,000 to 5,000) follows a coastal route from Cook Inlet around the Gulf of Alaska to the Copper River Delta and south to California. In the former two areas, as well as at any other stops further south, geese could be exposed to oil spills from tankers transiting the west coast from the TAPS terminus in Valdez.

In addition, those stopping in Cook Inlet (location of 5 state game refuges) could be exposed to oil spills originating from platforms or tankers associated with current or future production State waters, or tanker traffic between TAPS and refineries located in Cook Inlet or the refineries and Pacific Rim east markets (currently estimated at 38 per year). At any stopover points along this route, they also could be exposed to fuel spills from other vessels. Since the white-fronted geese follow similar routes north during spring migration, they would be exposed to similar risks from oil spills and other adverse factors (e.g., disturbance, habitat degradation).

In particular, stopover areas in Cook Inlet are subject to increasing disturbance from aircraft and recreational activities. Future operations on proposed State coal leases as well as current agricultural development on the west side of Cook Inlet could also result in increasing levels of goose disturbance and deterioration of water quality that may have long-term adverse impacts.

Adverse factors on the wintering grounds include harvests, disease, disturbance, and declines in habitat availability and/or quality resulting from changing patterns of land use. Fall hunting nearly all in California resulted in a harvest of approximately 14,000 white-fronted geese in 1985 (about 9% of the estimated winter population). Specific information which would quantitatively relate harvest, disturbance, disease, declining habitat availability or quality (e.g., reduced forage or water quality) in the wintering areas to declines in the white-fronted goose population is not available. Nor is sufficient harvest or environmental information available from Mexican wintering areas to allow specific projections of impact on the population to be made. However, if availability of suitable habitat continues to decline on the winter range (e.g., draining of wetlands), it can be expected that a corresponding decline in the white-fronted goose population may result in its increased vulnerability to the adverse factors discussed above.



Although white-fronted geese nest in a variety of habitats, they prefer elevated areas generally somewhat further inland, and with nests more dispersed, than other geese. This suggests that nesting adults or newly-hatched young would not be vulnerable to oil spills except in the case of strong onshore winds during high tides, or in the event of a storm surge. However, if an oil spill were to occur from late June to August when brood rearing, molting, and staging for migration takes place on lower elevation intertidal mudflats and sloughs, chances range from 10 to 100 percent that a substantial proportion of white-fronted goose breeding adults and young could be contacted, thereby, experiencing increased mortality and/or decreased recruitment for several years (Truett et al., 1984).

Residual oil from an oil spill deposited outside this period also could result in substantial oiling of geese. Estimated mean number of oil spills for Bering Sea Planning Areas (North Aleutian, St. George, Navarin, and Norton Basins, see Table IV.B.4-2) is 21; however, oil spill trajectory analysis Norton Sound Planning Area (DOI, MMS, 1985c) indicates that the probability of an oil spill contacting the Y-K Delta is 16 percent or less within 30 days. However, tankers servicing future Norton Basin platforms are likely to pass in the vicinity of the delta, thereby substantially increasing the risk of shoreline contact.

Likewise, there is negligible probability of an oil spill that originates in the North Aleutian Basin (one spill estimated) would contact white-fronted goose nesting areas on the Bristol Bay Lowlands. No onshore facility construction is contemplated in either area.

Migrants which make an intermediate stop in the northeastern Bristol Bay area (i.e., Naknek River to Cinder River, classified as State Critical Habitat Areas, staging area for about 25,000 white-fronted geese) could be exposed to an oil spill from the North Aleutian area; however, probability of oil spill occurrence and contact with these shoreline segments is negligible. Those geese (3,000 to 5,000) that stop in the Upper Cook Inlet area could be exposed to oil spills originating in Lower Cook Inlet, Gulf of Alaska or Kodiak from existing leases (4 oil spills estimated). Those geese stopping on the Copper River Delta State Critical Habitat Area and Bering River Delta could be exposed to oil spills from tankers transiting the west coast from the TAPS terminus in Valdez carrying oil from existing leases in the Beaufort Sea, as could those stopping on the Yakutat Forelands, Rocky Pass, and several points further south in coastal British Columbia, Washington, and Oregon. Use of the areas south of the Alaska Peninsula probably amounts to less than 5 percent of the total Pacific flyway population.

Since nearly all Pacific flyway white-fronted geese overwinter in California's Central Valley or other inland areas, activities associated with Federal offshore lease sales in this region are not likely to affect them significantly.

Since approximately 95 percent of the Pacific flyway white-fronted goose population nests on the Y-K Delta and overwinters in the Central Valley of California, factors in these two areas are likely to exert primary control over changes in distribution and abundance of this population. Factors acting on migrants stopping in northeastern Bristol Bay (approximately 15% of the population) could have some influence, and those acting elsewhere probably are insignificant since they involve only a small proportion of the population.

If provisions of the Y-K Delta Goose Management Plan are effective in maintaining this population above the prescribed management level, then impacts of most factors other than the current and future 5-year programs should remain at a low level. However, if habitat availability on the winter range continues to decline, or if subsistence or sport takes should increase substantially, long-term impacts on the population could be consistently elevated.

An oil spill originating from existing Federal leases could have moderate impacts if contact with the delta occurred under conditions that promoted its reaching elevated nesting habitat in May

and June, and a high level of impact if it made contact from late June to August when both adults and young occupy low-lying tidal habitats that are vulnerable to virtually any oil spill. However, except for the possible grounding of a tanker in the vicinity of the delta, the probability of oil contact there appears extremely low. The overall impacts from past, present and future Non-OCS and past and present OCS activities are moderate.

The current and future 5-year programs suggest that development and production could increase in the future, and while overall impacts may not be elevated above moderate or high as discussed above, their certainty of occurrence may increase. If oil spills were to occur in more than one area visited by this population the level of impact might not be elevated significantly since the Y-K Delta is the primary area where oil spills could have a severe impact, most other areas being occupied by a relatively small proportion of the population (migration) or removed from contact by oil spills (winter).

**CONCLUSION:** The cumulative impacts on the white-fronted goose is expected to be moderate.

(b) Emperor Goose

The Y-K Delta emperor goose population recently has shown signs of stabilizing following an apparently steady decline (approximately 70%, accelerated in 1982-1986) from high population levels in the 1960's. The current Alaska spring population estimate (1988) is 53,800 (DOI, FWS, 1989b). Probable factors responsible for these trends include climatic variables, subsistence and sport hunting, egg gathering, and regulation of harvest activities.

On the delta breeding grounds, where 80-90 percent of the emperor population nests, important adverse factors include subsistence harvest of nesting geese and their eggs, and persistent ice and snowcover and/or flooding on nesting areas. Harvest in 1987 was 676 in spring (50% of total harvest) and 146 (11%) in early summer (Copp, 1987). Total harvest on the delta in 1987 (1352) 2.6 percent of the spring population count. Only 43 emperor eggs were estimated to have been taken on the delta. It is a substantial increase over the previous year. Harvest of both emperors and their eggs is prohibited by the Y-K Delta Goose Management Plan. Effects of current and potential disturbance factors on the delta are essentially as discussed above for the white-fronted goose.

Potential impacts associated with oil and gas production would result primarily from oiling of low elevation habitats, especially those regularly influenced by tides. Probability that an oil spill contacting the delta will reach grass/sedge meadows preferred by emperors for nesting (not flooded by ordinary tides but commonly flooded by storm surge) ranges from 10 to 100 percent. Likewise, there is a strong chance of oiling a substantial proportion of breeding adults and young on tide-influenced meadows and sloughs where brood rearing, molting and migration staging take place from late June to August.

Sources of an oil spill with the potential to affect emperors would be the same as those discussed for the white-fronted goose. The potential exists for small numbers of emperors nesting on Nunivak Island, St. Lawrence Island, along the northern coast of the Seward Peninsula, and near Kivalina north of Kotzebue to be contacted by an oil spill originating from existing leases in St. George/Navarin Basins and Chukchi Sea, respectively, but the probability of an oil spill occurring and contacting these areas is slight.

A molt migration of subadults and failed breeders to St. Lawrence Island occurs in June (DOI, FWS, 1989b). This may involve 10,000 to 20,000 individuals, but the probability of contact by oil spills originating from existing leases either in Norton or Navarin Basins is very low.

Following the nesting period and molt, emperor geese move to lagoons along the north side of the Alaska Peninsula from August to November (peak in September/October). Most lagoons



receive some use by this species, but largest numbers are found most often in Nelson Lagoon (Port Moller), Seal Islands lagoon area (south of Port Heiden), Port Heiden, Cinder River delta and Izembek Lagoon (Dau, 1984; King and Derksen, 1983; Petersen and Gill, 1982).

These lagoons could be exposed to oil spills from existing leases in the St. George Basin, and especially the North Aleutian Basin where possible transportation scenarios include the use of tankers in proximity to the Alaska Peninsula, or a pipeline coming ashore at Port Moller. Oil spills originating in the leased areas do not have a high probability (19 percent within 30 days) of shore contact (DOI, MMS, 1985a; and DOI, MMS, 1985b) but the presence of pipelines or tankers near the peninsula could substantially increase this risk.

Spills originating in a proposed State lease area that extends along this portion of the peninsula could enter streams and eventually lagoons and bays occupied by this and other species. Entry of oil into peninsula lagoons during spring or fall migration periods could have severe consequences for emperor geese, both in the short-term when increased mortality may result in decreased recruitment into the population, and long-term as a result of hydrocarbon retention and subsequent release in these relatively low-energy habitats. Of course the latter could occur whether geese were present initially or not.

Disturbance during construction of a pipeline across the peninsula could result in some minor stress and disruption of foraging patterns, but is likely to have only short-term consequences. Emperor geese staging prior to migration in Izembek Lagoon, however, could experience elevated levels of disturbance from aircraft operation as a result of its proximity to the Cold Bay airport favored as an air-support facility for the North Aleutian lease area. Potential impacts during spring migration (March to early June, peak in March/April) would be similar to fall since the same areas are utilized.

Emperor geese overwinter throughout the Aleutian Islands and east to the Kodiak Island area. Although there are no leases adjacent to the Aleutians, oil spill trajectories from the St. George Basin suggest that most if not all of the islands could be contacted by a large oil spill in this season. However, unless drilling commences on St. George Basin leases, most winter mortality in the former area is likely to result from non-OCS causes. In the fall season, only the easternmost islands are likely to be contacted. As a result of currents circulating from east to west in the Gulf of Alaska, that segment of the population wintering further east could be exposed to oil spills from tankers serving the Valdez terminus of TAPS or refineries in Cook Inlet, or originating from Cook Inlet platforms on State leases.

As discussed above, emperor geese preferentially nest in loose colonies on grass/sedge meadows on the outermost portion of the delta commonly flooded by very high tides and storm surge. In addition, brood rearing, molting, and preparation for migration also take place in low elevation habitats, thereby, exposing large numbers of emperors to oiling, particularly if an oil spill were to contact the delta during the period May through August. Residual oil from an oil spill deposited outside this period also could result in substantial oiling of geese. Twenty-one oil spills are estimated for lease areas in the vicinity of the Y-K Delta (Norton, Navarin, St. George, North Aleutian) from the current and future 5-year programs. However, oil spill trajectory analysis for the Norton Sound Planning Area (DOI, MMS, 1985c) indicates that the probability of oil spills contacting the delta is 16 percent or less within 30 days.

Passage near the delta of tankers servicing Norton Basin platforms could increase substantially the risk of shoreline contact. Relatively small numbers of nesting and post-nesting emperors occupying scattered sites as noted above could be affected by oil spills originating in Chukchi Sea, Hope, Norton, Navarin, St. George, and North Aleutian Basins (29 oil spills estimated, see Table IV.B.4-2), but the probability of an oil spill contacting these areas is very low. Likewise,

emperors gathering at St. Lawrence Island following molt migration in June are not at high risk from oil spills originating in lease areas.

Likewise, impacts on emperor geese wintering in the Aleutian Islands would be similar to those described above. Birds wintering in the Kodiak Island-Alaska Peninsula area could be exposed to a total of five oil spills estimated for Gulf of Alaska, Cook Inlet, Kodiak and Shumagin Planning Areas combined, and in addition, to oil spills from tankers transiting the west coast from the TAPS terminus in Valdez carrying oil from Beaufort lease areas.

Since most of the emperor goose population is concentrated seasonally in three areas (Y-K Delta, nesting; Alaska Peninsula lagoons, staging; Aleutian Islands-Kodiak Island, wintering), factors in these areas are likely to exert primary control over changes in distribution and abundance of this population. Elsewhere in Alaska, a relatively small proportion of the population is at risk.

If provisions of the Y-K Delta Goose Management Plan are effective in returning this population to and maintaining it above the prescribed management level, then effects of most factors other than the current and future 5-year programs should remain at a low level. However, if habitat availability on the winter range continues to decline, or subsistence or sport harvest should increase substantially, long-term impacts on the population could be consistently elevated.

Oil spills originating from existing Federal leases could have moderate impacts if contact with the delta occurred under conditions that promoted reaching nesting habitat in May and June, or a relatively limited proportion of staging or winter habitat. High impacts could result if an oil spill contacted the delta from late June through August when both adults and young occupy low-lying tidal habitats that are vulnerable to virtually any oil spill. Likewise, high impacts could result from oil spill contact with a substantial proportion of staging or wintering habitat. However, except for a tanker spill in the vicinity of the delta, a pipeline or tanker spill in the vicinity of the Alaska Peninsula, or a large oil spill in the vicinity of the Aleutians, the probability of oil contact with these areas is low to negligible. The expected impacts from past, present and future Non-OCS and past and present OCS activities are moderate.

The current and future 5-year programs suggest that Federal oil and gas development and production could increase in the future, and while overall impacts may not be elevated above moderate or high as discussed above, their certainty of occurrence may increase. The potential for a high level of impact is increased as a result of emperor geese concentrating in lagoons along the Alaska Peninsula during their migration, because more geese may be exposed to any single oil spill.

It is unlikely that an oil spill from the North Aleutian Basin would contact the Alaska Peninsula and a lesser possibility of it occurring during a critical migration period, entering a coastal lagoon, and contacting geese on the water. Although any oiled geese are likely to suffer high mortality, it is highly unlikely that any single oil spill would contact all of the emperor geese or their habitat along the Alaska Peninsula simultaneously. Therefore, the current and future 5-year programs are not expected to substantially increase the existing moderate cumulative impact on emperor geese.

**CONCLUSION:** The cumulative impacts on the emperor goose is expected to be moderate.

(c) Cackling Canada Goose

The Y-K Delta cackling Canada goose population recently has exhibited signs of stabilizing following a massive decline (95%) from high population levels in the 1960's. The fall 1988 population estimate is 69,900 (DOI, FWS, 1989c). Probable factors responsible for these



trends include climatic variables, subsistence and sport hunting, egg gathering, predation, winter habitat availability/quality, and regulation of harvest activities.

On the delta breeding grounds, where over 90 percent of the cackling Canada goose population nests, important adverse factors include subsistence harvest of nesting geese and their eggs, persistent ice/snowcover and/or flooding on nesting areas, and predation. Harvest in 1987 was 2,003 in spring (62% of total harvest) and 293 (9%) in early summer (Copp, 1987). Total harvest on the delta (3,218) was 4.6 percent of the fall population estimate. About 194 cackler eggs were estimated to have been taken on the delta. This is a substantial increase over the previous year. Harvest of both cacklers and their eggs is prohibited by the Y-K Delta Goose Management Plan. Impacts of current and potential disturbance factors on the delta are essentially as discussed above for the white-fronted goose.

Potential impacts associated with oil and gas production would result primarily from oiling of low elevation grass/sedge meadow habitat near the delta fringe preferred by cacklers for nesting. Although this habitat is not flooded by ordinary tides, under storm surge conditions there is high probability that it would be affected by any oil contacting the delta. Where tide-influenced habitats are utilized for brood rearing and molting, both adults and young would be at risk. Sources of an oil spill with the potential to affect cacklers would be the same as discussed for the white-fronted goose.

By mid to late August, following the nesting period and molt, cacklers gradually move to staging areas on the north side of the Alaska Peninsula, primarily Pilot Point in Ugashik Bay and the Cinder River delta. These areas could be exposed to oil spills from existing leases in the St. George Basin or North Aleutian Basin, but the probability of contact is extremely low. However, if tankers servicing these areas were to enter the nearshore zone the risk could be increased substantially. Entry of oil into primary staging areas along the peninsula during spring or fall migration periods could have severe consequences for cackling Canada geese, both in the short-term when increased mortality may result in decreased recruitment into the population, and in the long-term as a result of hydrocarbon retention and subsequent release in these relatively low-energy habitats.

The current level of disturbance and its impact on geese in the staging areas has not been quantified, but it is likely to increase over the next several decades and potentially could become a significant factor, especially if expansion of human activities results in decreased availability of suitable habitat.

In mid-October cacklers proceed directly from the Alaska Peninsula to intermediate stopover areas in Oregon (Willamette Valley) and northern California (Klamath Basin). By December a majority are on the primary wintering grounds in the Central Valley of California. Since hunting currently is prohibited, the greatest threats to cacklers in this area are the declining availability of suitable habitat and increasing level of disturbance.

Quantitative information relating these factors to declines in the cackler population is not available, but it is likely that continued habitat loss would contribute to such a trend. During spring migration cacklers return to the Y-K Delta by way of marshes in Upper Cook Inlet, as well as tidelands in Southeast Alaska, Copper/Bering River Deltas and Prince William Sound. In these areas geese could be exposed to oil spills from tankers serving the TAPS or Kenai Peninsula refineries. In Cook Inlet, oil spills originating from State lease areas could affect spring migrants, and at any stopover points they could be exposed to fuel spills from other vessels as well as increasing levels of disturbance from aircraft and recreational activities. In addition, future operations on proposed State coal leases as well as current agricultural development on the west side of Cook Inlet could result in increasing levels of goose disturbance and deterioration of water quality that may have long-term adverse impacts.

Like the other goose species nesting on the outer coast of the Y-K Delta, cacklers are vulnerable to oiling by oil spills which contact the coastline. Vulnerability of cacklers probably is more similar to the white-fronted than the emperor goose since they commonly nest in the more elevated grass/shrub transition zone which is seldom flooded. Details of the potential oil spill risk and impacts to which cacklers may be exposed while on the delta are discussed under the same topic for white-fronted and emperor geese. Likewise, potential risks and impacts of oil spills in the vicinity of Alaska Peninsula staging areas in fall and Gulf of Alaska and especially Upper Cook Inlet staging areas in spring (10,000+ individuals) would be essentially as described for the white-fronted goose and in the previous section. Since nearly all cacklers overwinter in California's Central Valley, activities associated with Federal offshore lease sales in this region are not likely to affect them significantly.

If provisions of the Y-K Delta Goose Management Plan are effective in returning the cackling Canada goose population to and maintaining it above the prescribed management level, then impacts of most factors other than Federal lease sales included in the current and future 5-year programs should remain at a low level. However, if habitat availability on the winter range continues to decline, or subsistence or sport harvest should increase substantially, long-term impacts on the population could be consistently elevated.

An oil spill originating from a existing Federal leases could have moderate impacts if contact with the delta occurred under conditions that promoted its reaching nesting habitat in May and June, or a relatively limited proportion of staging or winter habitat. High impacts could result if an oil spill contacted the delta from late June through August when many adults and young occupy low-lying tidal habitats that are vulnerable. Likewise, high impacts could result from oil spill contact with a substantial proportion of the habitat occupied by staging geese on the Alaska Peninsula. However, except for a tanker spill in the vicinity of the delta or peninsula, the probability of oil contact with these areas is low to negligible. The expected impacts from past, present and future Non-OCS and past and present OCS activities are moderate.

The current and future 5-year programs suggests that Federal oil and gas development and production could increase in the future, and while overall impacts may not be elevated above moderate or high as discussed above, their certainty of occurrence may increase. The potential for a high level of impact is increased as a result of cackling Canada geese concentrating in lagoons along the Alaska Peninsula during their migration, because more geese may be exposed to any single oil spill.

It is unlikely that an oil spill from the North Aleutian Basin would contact the Alaska Peninsula and a lesser possibility of it occurring during a critical migration period, entering a coastal lagoon, and contacting geese on the water. Although any oiled geese are likely to suffer high mortality, it is highly unlikely that any single oil spill would contact all of the cackling Canada geese or their habitat along the Alaska Peninsula simultaneously. Therefore, the current and future 5-year programs are not expected to substantially increase the existing moderate cumulative impact on cackling Canada geese.

**CONCLUSION:** The cumulative impacts on the cackling Canada goose are expected to be moderate.

#### (d) Pacific Black Brant

Although the Pacific flyway population of the Pacific black brant has not exhibited the marked declines typical of other species, there have been significant changes in seasonal distribution as well as a general downward trend from high population levels of the 1960's (approximately 30%). The current midwinter population estimate is 138,000 (DOI, FWS, 1989d). Probable factors responsible for these trends include climatic variables, subsistence and sport hunting, egg gathering, predation, and regulation of harvest activities. Major distributional changes have occurred in both wintering and breeding ranges. Prior to 1960, about 54,000 brant



wintered along the coast of Washington, Oregon, and California; in recent years this number has declined to about 10,000 with a corresponding increase in the numbers overwintering in Mexico. On the Y-K Delta breeding grounds, much formerly-utilized habitat remains vacant; from 1981 to 1986 numbers of brant breeding in three censused areas declined from about 22,000 to 8,000 (62%). Evidently, the breeding activity of a substantial proportion of the black brant population has shifted to other northern localities.

On the delta breeding ground, where now less than 20 percent of the brant population nests, important adverse factors include persistent ice and snowcover and/or flooding of nesting areas, predation, and subsistence harvest of nesting geese and their eggs. In arctic breeding areas, currently climatic factors and predation are most important. Harvest in 1987, was 383 in spring (37% of total harvest) and 244 (24%) in early summer (Copp, 1987). Total harvest on the delta in 1987 (1030) represented about 1 percent of the winter population estimate. Egg gathering on the delta (134) declined from the previous year.

Although general impacts of current and potential disturbance factors are essentially as discussed previously for the white-fronted goose, it is evident from recent studies that brant are the most easily and severely disturbed species of the four considered (Ward et al., 1988). Predation also appears to be a more severe problem for brant than the other species. In large concentrations, the brant's colonial nesting habit is advantageous by swamping predators; in the smaller colonies that now exist on the delta, this impact is reduced and may result in greater predator efficiency. The brant's inability to defend its nest may intensify this impact. Almost complete nesting failure due to predation was documented at one colony studied in 1985.

Potential impacts associated with oil and gas production would result primarily from oiling of low elevation grass/sedge meadow and elevated intertidal mudflat habitats at the outermost fringe of the delta preferred by brant both for nesting and brood rearing. By nesting in habitats in or close to the tidal zone brant expose their nests to tidal flooding, and thus to oiling from oil spills transported by high tides or storm surge. Later in the summer molting adults and young would be at risk in these same habitats. Sources of an oil spill with the potential to affect brant would be the same as discussed for the white-fronted goose.

A migration of as much as 20 percent (10,000 to 20,000) of the brant population to the Teshekpuk Lake-Cape Halkett area on Alaska's arctic slope takes place in late June and July. Here they molt and then join brant that have nested on the slope and their young in Beaufort Sea coastal lagoons. In August and September, these post-molting and post-breeding birds migrate westward along the Beaufort coast and southward along the Chukchi and Bering Sea coasts, stopping frequently in lagoons to rest and feed, until they join the remainder of the brant population staging from September to November at Izembek Lagoon on the north side of the Alaska Peninsula (Truett, 1983).

This segment of the population could be exposed to both oil spills and disturbance from activity associated with State and Federal leases along the Beaufort Sea coast, and with Federal leases along the Chukchi and Bering Sea coasts. Since nearly all Pacific black brant stage in Izembek Lagoon, an oil spill entering this area poses the greatest risk to the population on its northern range. Potential sources of oil spills, their probability of occurrence and contact, and possible consequences in this area are as discussed for the emperor goose above. In addition to the direct impacts of oil exposure, brant, as a result of their restricted diet, are extremely vulnerable to reduced forage that may result from oiling of eelgrass, their primary food source.

Brant could experience elevated levels of disturbance from aircraft operation as a result of the proximity of Izembek to the Cold Bay airport favored as an air-support facility for the North Aleutian lease area. Although brant obviously are greatly disturbed by aircraft overflights of the lagoon, as well as other types of human activity, no definite correlation between

disturbance and their ability to store adequate energy reserves for continued migration or reproduction has been proven (DOI, MMS, 1985). Disturbance does reduce brant foraging efficiency (Derksen et al., 1979). Brant utilize many of the same lagoons on their northward migration in April and May, particularly Izembek Lagoon, thus potential adverse impacts are likely to be similar to those discussed above.

Over 90 percent of the brant population winters along the coasts of Baja California and mainland Mexico, most flying there directly from Izembek. The remainder (7.5%) winter along the west coast from California to British Columbia, although this number has declined. Several thousand may remain at Izembek, especially in mild winters. It is evident that if recent trends in the number of brant wintering in these areas is an indication, a declining proportion of the population is likely to be affected by oil and gas development activity, disturbance from various other human activities, habitat reduction, changes in water quality, and hunting in the future. Potential impacts of adverse factors that may affect the bulk of the population wintering in Mexico are unknown at present, but are likely to include many of those discussed above as the development of coastal western Mexico proceeds.

Because of their habit of nesting on the extreme outer fringe of the Y-K Delta, brant are vulnerable to oiling by virtually any oil spill which contacts the coastline. Likewise, post-molt and post-breeding brant resting and foraging in coastal areas in northern and western Alaska while in migration to Izembek Lagoon are extremely vulnerable to oil spills (19 estimated for all activities associated with lease areas adjacent to this migration corridor). Details of the potential oil spill risk and impacts to which brant may be exposed while occupying these areas are discussed under the same topic for white-fronted and emperor geese, as well as in the previous section.

Similarly, potential risks and impacts of oil spills and disturbance in the vicinity of Alaska Peninsula staging areas in spring and fall would be essentially as described for the emperor and cackling Canada geese, and in the previous section above. Since nearly all brant overwinter along coastal western Mexico, only the relatively small proportion (7.5%) of the population wintering further north along the west coast are likely to be affected by activities associated with future federal offshore lease sales.

If provisions of the Y-K Delta Goose Management Plan are effective in maintaining the brant population above the prescribed management level, then impacts of most factors other than Federal lease sales included in the current and future 5-year programs should remain at a low level. However, if habitat availability/quality on the winter range were to decline, or substantial increases in level of disturbance at Izembek Lagoon or subsistence or sport harvest were to occur, long-term impacts on the population could be consistently elevated.

An oil spill originating from existing Federal leases could have moderate impacts if contact with the delta occurred under conditions that promoted its reaching nesting habitat in May and June, if an oil spill entered Beaufort Sea coastal areas prior to the point at which both post-molt and post-breeding adults and their young are present in substantial numbers, or if a relatively limited proportion of winter habitat were contacted by an oil or fuel spill.

High level of impact could result if an oil spill contacted the delta from late June through August when many adults and young occupy low-lying tidal habitats that are vulnerable, or important staging areas along the Beaufort Sea coast from mid to late summer, or a limited portion of Alaska Peninsula staging habitat were contacted. Very high impacts could result from oil spill contact with a substantial proportion of the habitat occupied by staging geese on the Alaska Peninsula. However, except for a tanker spill in the vicinity of the delta or peninsula, or platform/pipeline spill in the Beaufort or Chukchi Sea, the probability of oil contact with most of the coastline in these areas is low to negligible. It is expected that the



overall impacts from past, present and future Non-OCS and past and present OCS activities are moderate.

The current and future 5-year programs suggest that Federal oil and gas development and production could increase in the future, and while overall impacts may not be elevated above moderate or high as discussed above, their certainty of occurrence may increase. The potential for a high level of impact is increased as a result of black brant concentrating in Izembek Lagoon on the Alaska Peninsula during their migration, because more geese may be exposed to any single oil spill.

It is unlikely that an oil spill from the North Aleutian Basin would contact the Alaska Peninsula and a lesser possibility of it occurring during a critical migration period, entering a coastal lagoon, and contacting geese on the water. Although any geese are likely to suffer high mortality, it is highly unlikely that any single oil spill would contact all of the black brant or their habitat along the Alaska Peninsula simultaneously. Therefore, the current and future 5-year programs are not expected to substantially increase the existing moderate cumulative impact on black brant.

**CONCLUSION:** The cumulative impacts on the Pacific black brant are expected to be moderate.

(e) Other geese

Five of the remaining geese have restricted breeding and/or wintering ranges. The few thousand tule geese nest in Redoubt Bay, Cook Inlet, and winter in three small areas of California. This race of white-fronted goose has been proposed for addition to the List of Endangered and Threatened Wildlife. Dusky Canada geese, population 10,000 to 15,000 and declining, nest primarily on the Copper River Delta and winter in eastern Oregon. Most Vancouver Canada geese, population 40,000 to 50,000, nest and winter in southeast Alaska. The few thousand lesser Canada geese nest in the Cook Inlet area. Lesser snow geese, population about 40,000, nest on Wrangel Island off Siberia and winter in California's Central Valley. Taverner's Canada geese, population about 100,000, breed in interior Alaska and on the Y-K Delta and winter in the Columbia River Basin in Washington and Oregon, and in central California.

In their extremely restricted breeding area, tule geese and lesser Canada geese could be vulnerable to oil spills from tankers serving the TAPS terminus in Valdez or Kenai Peninsula refineries, production platforms in Cook Inlet, or fuel spills from other vessels. Dusky Canada geese, also restricted in breeding range, could be vulnerable to oil spills from tankers serving TAPS or fuel spills from other vessels. In recent decades they have experienced extremely poor reproductive success, primarily as a result of high rates of predation, but also frequently from unfavorable weather early in the breeding season.

Likewise, Vancouver Canada geese could be exposed to oil spills from tankers serving TAPS, or fuel spills throughout the year. Lesser snow geese could be vulnerable to oil spills during spring staging in Cook Inlet, fall staging on St. Lawrence Island, Seward Peninsula, the Yukon Delta and in Ugashik Bay. Taverner's Canada geese could be exposed to oil spills and increased disturbance primarily during fall staging at Izembek Lagoon on the Alaska Peninsula. On the breeding, staging, and especially on the wintering grounds, declining availability/quality of suitable habitat and increasing disturbance from human activities are likely to have adverse impacts on all of these species of geese. The overall impacts from past, present and future Non-OCS and past and present OCS activities are expected to have a moderate effect on geese.

The current and future 5-year programs suggest that oil and gas development and production could increase in the future, thereby elevating the oil spill risk to which all of these species would be exposed. Tule geese, lesser Canada geese, and lesser snow geese could be affected by

oil spills from Cook Inlet, Gulf of Alaska, or Kodiak lease areas. Dusky and Vancouver Canada geese could be affected by oil spills from the Gulf of Alaska lease area or tankers serving TAPS. Taverner's Canada geese could be affected by an oil spill from the North Aleutian Basin.

Although impacts on the tule goose potentially could be high from adverse factors other than the current and future 5-year programs, or very high as a result of its nesting in a restricted area vulnerable to oil spills from several lease areas and other sources, it is unlikely that an oil spill would contact Redoubt Bay (USDOI, MMS, 1984). Likewise, dusky Canada geese, and perhaps lesser Canada geese, currently approach high impacts from non-OCS factors; oil spills could make this level of impact occur with greater certainty, but the probability of an oil spill contacting their primary habitats is low. Vancouver Canada geese could experience moderate impacts from oil spill contact, but it is highly unlikely that an oil spill would contact their habitats in southeast Alaska. Likewise, lesser snow geese could experience moderate impacts from oil spills. Taverner's Canada geese could experience moderate to high impacts if an oil spill were to enter Izembek Lagoon when they are concentrated here during fall staging.

**CONCLUSION:** The cumulative impacts on other goose species are expected to be moderate.

## **(2) Diving Ducks**

Of the 18 species of diving ducks that breed in Alaska, oldsquaw and common and king eiders are the most abundant to occur in Beaufort, Chukchi, and Bering Sea coastal habitats. During migration and/or molting periods perhaps 500,000 oldsquaw, several hundred thousand common eiders, and one million or more king eiders utilize these coastlines. Bering Sea coastal habitats also are occupied by perhaps one million scoters, Steller's eiders, scaup, and other diving ducks during these periods, and substantial numbers of several species are found seasonally as far south as the Pacific northwest and California.

Activities that could produce significant adverse impacts in diving duck populations include oil and gas development on current Federal leases in the Bering, Chukchi, and Beaufort Seas; current and future State oil and gas leases in Beaufort and Bering Sea areas and Cook Inlet; onshore Federal oil and gas development (including ANWR); the TAPS; Canadian Beaufort production; increasing levels of disturbance from operation of aircraft, boats and vehicles and other human activity in areas where ducks are engaged in activities that make them particularly sensitive; expansion of residential and recreational land use; subsistence harvest of birds and their eggs; and sport harvest.

Persistent ice and snowcover and/or flooding of nesting areas, severe weather during spring migration, predation, decreased food availability during critical foraging periods, and declining water quality also can result in adverse impacts.

The oldsquaw is the most abundant breeding duck on the arctic coastal plain (Truett, 1983), possibly numbering 100,000 to 200,000, but substantial numbers of several other species, including Steller's and spectacled eider, also nest here and, thus, also could be exposed to oil spills from current and future state and Federal onshore lease areas, as well as TAPS, particularly if oil spills were to spread along major watercourses. Disturbance associated with petroleum development on the coastal plain could displace nesting waterfowl from preferred habitat, although there is evidence that oldsquaw do not readily abandon areas subjected to short-term intermittent disturbance (Johnson and Richardson, 1981; Johnson, 1982).

Fox predation on common eiders nesting on barrier islands along Beaufort and Chukchi Sea coasts (includes a majority of those nesting on the Alaskan arctic slope) is a major cause of breeding failure in this species; disturbance causing them to abandon secure islands could have adverse impacts on productivity. Any of the nesting species could be affected adversely by



other factors noted above such as persistence of unfavorable nesting conditions in early summer, elevated or concentrated predator populations, elevated levels of disturbance in the breeding area (from recreational or industrial activity), decreased water quality, and increased harvests.

Waterfowl populations are most vulnerable when they occupy limited coastal aquatic habitats during the molting or migration periods. During the post-breeding molt period, which extends from mid-July to mid-August, as many as a half-million oldsquaws, together with large numbers of other tundra-nesting species, may occupy Beaufort Sea lagoons and bays. Beginning in early July, hundreds of thousands of molt-migrant king eiders and tens of thousands of common eiders (males and nonbreeding birds) move westward along the Beaufort Sea coast primarily from Canadian breeding grounds; however, apparently few stop for any length of time until reaching molting areas along Chukchi and Bering Sea coasts. In late July broods of common eiders also move from the barrier islands to the lagoons. By mid-August, most oldsquaw males and nonbreeders have departed, and in September females with their young begin the southward migration. Although many eastbound spring migrants follow the Beaufort coastline in May and June (Flock, 1973), they are commonly recorded well inland and offshore (Divoky, 1983). For example, most common and king eiders appear to follow leads in the pack ice far offshore (40 km recorded); likewise, oldsquaws follow various routes but those near the coast frequently stop in the open water at river mouths to feed (since water is frozen elsewhere), joining coastal migrant eiders. Unseasonably cool weather occasionally may result in high mortality in king eiders and other species. Barry (1968) estimated that 100,000 king eiders died of starvation in 1964 as a result of a late thaw in the Beaufort Sea area.

The fact that spring migrants are strongly attracted to the limited open water available suggests both that large numbers could succumb in any large oil-contaminated lead, and that they might be attracted to oil on the ice surface (its dark appearance suggesting open water; Johnson and Richardson, 1981). It is evident that the potential oil spill risk to these species, especially oldsquaws, is high during migration and molt periods. Oil spills could originate onshore and follow major rivers into the lagoons, or at nearshore/offshore platforms or pipelines. The large numbers of eiders and oldsquaws that nest on the Canadian coastal plain also could be at risk from oil spills in the Canadian Beaufort. Overall, however, oil spill impacts are not likely to exceed a moderate level, because of the large regional population of these species and their substantial reproductive potential, except oldsquaws exposed to more than one oil spill in areas of concentration within relatively short periods (1 or 2 generations) could experience high impacts.

Seasonal use of the Chukchi Sea coastal area is similar to that of the Beaufort in that most eiders (about 1 million king, 10's of thousands common) and oldsquaws (several 100 thousand) pass through during spring and fall migration, substantial numbers molt in coastal lagoons, and a relatively small proportion of their populations actually nest in the area. Spring migration occurs from about mid-May to mid-June over a broad front with coastal, offshore, and inland routes used by various species. To a great extent the timing of migration varies with the wind direction and corresponding availability of open water (Divoky, 1983). A prominent and recurring offshore lead system extends between Pt. Hope and Pt. Barrow that is followed by most migrating waterfowl, and others probably are followed north from the Bering Strait. Strong headwinds of refreezing/closing of leads can retard their progress and cause them to be concentrated in remaining open water. Once conditions improve, they may proceed long distances nonstop. For example an estimated 500,000 king eiders may have flown over 480 km from Cape Lisburne area to Pt. Barrow in a single day (Woodby and Divoky, 1982).

In the northern Chukchi Sea area, a few thousand common eiders, representing a majority of those that nest in this area, nest in colonies along barrier islands of Kasegaluk Lagoon. In early

July, 100's of thousands of molt-migrant king eiders (mostly males) return along the coast; by mid-August, females and juveniles begin to predominate (Lehnhausen and Quinlan, 1981). Flocks are present in the lagoon and Peard Bay and in nearshore waters off Pt. Lay and in Ledyard Bay after midsummer and large-scale movements begin in late July, continuing until early October. Some remain until mid-November as long as open water persists. South of Cape Lisburne, migrants proceed farther offshore (Springer et al., 1982). In late June soon after spring migration has ceased, there is a substantial northward movement of molt-migrant oldsquaws from more southerly areas. Large numbers of these molting birds are present in lagoons and along barrier islands, especially in Kasegaluk Lagoon and Peard Bay, from mid-July until late August. Fall migration is underway by early September and large flocks of hundreds or thousands may stop in the nearshore zone to rest and feed (Timson, 1976). Few remain after mid-October.

Oil spills may originate from platforms or pipelines in the Chukchi Sea lease area (probability of shore contact within 30 days in summer ranges up to 77%). Areas judged most vulnerable include: the spring lead system where extremely large numbers of migrating eiders and oldsquaws are concentrated; nearshore waters and lagoons from Cape Lisburne to Pt. Barrow in summer, which includes common eider breeding colonies and concentrations of 10's to 100's of thousands of molting eiders and oldsquaws; and these areas in fall when large numbers of migrant eiders and oldsquaws frequently stop to rest and feed (Roseneau and Herter, 1984). Likewise, in Kotzebue Sound open leads in spring and coastal areas in summer and fall are important habitats vulnerable to oil spills of tanker origin. Impacts of oil spills experienced by these three species could range from a moderate (single oil spill exposure) to a high (multiple oil spill exposure) level, for although each has a large regional population with substantial reproductive potential, large proportions of their respective regional populations are concentrated seasonally in vulnerable coastal areas. Among natural adverse factors, the occurrence of unseasonably severe weather during spring migration probably has the greatest potential for causing high mortality.

Although most of these three species' regional populations winter further south, an estimated 50,000 eiders and as many as 500,000 oldsquaws (Fay, 1961) typically remain in open water near St. Lawrence Island; smaller numbers winter in the vicinity of St. Matthew Island and Nunivak Island, as well as other openings in the seasonal pack ice. Probability of oil spill occurring in a lease area and contacting these areas generally is low; however, contact by an oil spill of tanker origin could occur, and in the case of St. Lawrence Island potentially result in high impacts if the highest estimates of oldsquaw abundance prevail, moderate if the number is closer to 100,000.

On the Y-K Delta, common nesting species include common and spectacled eiders, greater scaup, black scoter, oldsquaw and Barrow's goldeneye. Primarily eiders, especially spectacled, nest at sufficiently low elevation for occasional flooding (and potential oiling) during storm surges. Only during spring migration and the midsummer molting and brood rearing period are large concentrations of diving ducks at risk. In spring, as open water becomes available near the delta, large numbers of common and king eiders and oldsquaw, together with smaller numbers of Steller's eider and other species. Molting of male, subadult and nonbreeding eiders and oldsquaws occurs in the delta nearshore zone (and elsewhere in coastal Alaska) in July and August. A recently documented molt-migration of all three species of scoter, apparently including birds from other breeding areas, concentrates tens of thousands in the nearshore zone of the Y-K Delta, as well as other areas from Kotzebue Sound to Cook Inlet, in July and August. During these periods when diving ducks are concentrated, contact of the area by an oil spill, unlikely unless originating from a tanker, could result in moderate impacts.



Along the Alaska Peninsula several embayments, particularly Nelson and Izembek Lagoons, are of primary importance to migrating populations of diving ducks, but some provide wintering habitat as well. In spring king eiders move from their wintering areas (Bristol Bay, the Aleutian Islands, and adjacent southern Bering Sea, east to Kodiak Island) to congregate in large rafts (10,000 to 50,000; one estimated at 300,000) in bays and lagoons of the peninsula (Gill et al., 1978). Similar movements are undertaken by common eiders from wintering areas in the Gulf of Alaska, Aleutian Islands, and southern Bering Sea. Steller's eiders occur in large flocks during spring and fall migration periods in lagoons of Bristol Bay and Alaska Peninsula (Troy and Johnson, 1987). Up to 100,000, mainly males, molt in Nelson Lagoon from early August to late September. Females molt primarily in Izembek Lagoon. Following the molt, Steller's eiders move to wintering areas in the eastern Aleutians, Alaska Peninsula and east to Kodiak Island and Lower Cook Inlet. Spring migration involves a gradual return to the peninsula where they remain through early May. Migration apparently proceeds to Nelson Lagoon, Cape Peirce, Dall Point, St. Lawrence Island and Siberia, with small numbers following the Alaskan coast to the arctic slope. Risk to this population on its Siberian nesting areas is unknown.

Black scoters breed on coastal tundra, surf and white-winged in the interior of Alaska. Following their molt-migration to coastal areas large numbers of migrant black scoters (720,000 reported by Gill et al., 1981), as well as greater scaup, are found in Nelson Lagoon on the Alaska Peninsula. Most scoters winter in more southern areas along the Pacific coast to California, but several hundred thousand winter in the eastern Aleutians and south Alaska Peninsula, east to Kodiak Island, Lower Cook Inlet, and Prince William Sound where tens of thousands of white-winged and surf scoters have been reported (Arneson, 1980). Populations of any of these species wintering in the Gulf of Alaska area or along the west coast could be at risk from oil spills originating from tankers serving the TAPS terminus in Valdez. Estimated numbers in the Bering Sea and percent of North American population are: black, 489,000 (50%); surf, 116,000 (25%); white-winged, 401,000 (33%) (King and Dau, 1981). The 1987 subsistence harvest of black scoters was 5,987 (Copp, 1987). Spring migration through Bristol Bay occurs in late April. Of the many species wintering in the Kodiak Island area, oldsquaw (65,000), white-winged (35,000), black scoters (26,000) and harlequin duck (9,600) are the most numerous (Forsell and Gould, 1981). Across the Gulf of Alaska, in the Yakutat Bay area, white-winged and surf scoters are the most numerous species (Patten, 1981). Wintering populations of these two species occur all along the Pacific coast, and they are the most abundant waterfowl species off California. In most of the areas noted above, an oil spill is likely to have low to moderate impacts; however, if an oil spill were to enter Nelson Lagoon or Izembek Lagoon during migration, high impacts could result.

The highly migratory nature of most diving ducks suggests that during their annual cycle they will move through several OCS planning areas, and nest and overwinter in others, thereby potentially exposing their populations to multiple oil spills and other adverse factors associated with oil and gas development. Exposure of diving ducks to multiple oil spills under the current schedule is possible since leases are held in several planning areas; however, the present rate of development does not suggest that this is likely except potentially in the Beaufort Sea. Presumably, multiple oil spills are more likely with the addition of the current and future 5-year programs because of the inclusion of all Alaska planning areas as well as those adjacent to Washington, Oregon, and California. A multiple-spill scenario occurring within the equivalent of two generations would elevate projected impacts, or result in their occurrence with greater certainty.

Oldsquaws are most vulnerable when concentrated during the post-breeding molt and migration in Beaufort Sea lagoons from July to September and in Chukchi Sea lagoons from July to October, in the Chukchi Sea spring lead system in May and June, and in the St. Lawrence Island polynya in winter. Oldsquaws occupying these areas could experience high

impacts from oil spills, while those occupying offshore leads and river mouths in the Beaufort Sea and leads and other open water in the Bering Sea in spring, coastal areas of the Y-K Delta and Alaska Peninsula in spring and fall, and wintering areas where this species concentrates (e.g., Aleutians and Gulf of Alaska) could be subject to moderate impacts. Low impacts are more likely from oil spills and disturbance on the arctic coastal plain nesting area, and in the southern wintering range, southeast Alaska to California, where distribution is more sparse. Approximately 44 oil spills are estimated with the addition of the current and future 5-year programs within the range where oldsquaws are seasonally abundant (Beaufort Sea to Gulf of Alaska).

King and common eiders are most vulnerable when concentrated during post-breeding molt and migration in Chukchi Sea lagoons from July until October, in the Chukchi Sea spring lead system in May and June, and in lagoons along the Alaska Peninsula as well as openings in the retreating pack ice during spring migration in May and June. Eiders occupying these areas could experience high impacts from oil spills, while those occupying offshore leads and river mouths in the Beaufort Sea and leads in the Bering Sea pack ice in spring, coastal areas of the Y-K Delta in spring and fall, Beaufort Sea lagoons from July to September, and in wintering areas where these species concentrate (e.g., eastern Aleutians, southeastern Bering Sea, St. Lawrence Island polynya) could experience moderate impacts. Approximately 31 oil spills are estimated (see Table IV.B.4-2) with the addition of the current and future 5-year programs within the range where these species are seasonally abundant (Beaufort Sea to southern Bering Sea).

During spring and fall migration periods (April-May, August-September), Steller's eiders could experience high impacts if an oil spill were to enter Nelson or Izembek Lagoon on the Alaska Peninsula. With the addition of the current and future 5-year programs 31 oil spills could occur in areas traversed by this species during spring migration (Alaska Peninsula to arctic coastal plain).

Black, surf and white-winged scoters are most vulnerable when concentrated during post-breeding molt-migration in the nearshore zone of the Y-K Delta in July and August, and in Nelson Lagoon on the Alaska Peninsula in the period following molt. Scoters occupying these areas could experience high impacts from oil spills, while wintering concentrations from the eastern Aleutians to Prince William Sound are more likely to experience moderate impacts from an oil spill. Approximately 33 oil spills are estimated with the addition of the current and future 5-year programs within the range where these species are seasonally abundant (northern Bering Sea to Gulf of Alaska).

Impacts of most factors on diving duck populations other than oil spills from existing Federal leases and lease sales included in the current and future 5-year programs should remain at a low level. An oil spill originating from a presently leased OCS area could result in moderate to high impacts by contacting substantial proportions of populations of one or more species in this diverse group that are seasonally vulnerable in Beaufort Sea lagoons, Chukchi Sea lagoons and spring lead system, the St. Lawrence Island polynya, the Y-K Delta, and lagoons on the north side of the Alaska Peninsula. Elsewhere, potential impacts are likely to be low although a very large oil spill in the Gulf of Alaska originating from a tanker transporting oil from the TAPS terminus probably has the potential for producing moderate to high impacts in this area. The current and future 5-year programs suggest that oil and gas development and production could increase in the future, and while overall impacts may not be elevated above moderate or high as discussed above, their certainty of occurrence is likely to increase. The current and future 5-year programs increase oil spill risk in the Gulf of Alaska beyond that presently existing as a result of tankers transporting oil from the TAPS terminus. Multiple oil spills, more probable



under assumptions of the current and future 5-year programs, could elevate potential impacts if occurring within a period of one or two generations.

Given the oil spill estimates previously discussed, it is reasonable to assume that a major oil spill will occur and may enter a coastal area, lead, or lagoon where diving ducks are concentrated, contacting a portion of the local diving duck population. Although any oiled diving ducks are likely to suffer high mortality, it is highly unlikely that multiple oil spills would contact a significant proportion of the diving duck habitat along the Alaska and Pacific coastal regions simultaneously, and a lesser possibility of occurring during a critical migration period, entering a coastal area, and contacting ducks on the water. Therefore, the current and future 5-year programs are not expected to substantially increase the existing moderate cumulative impact on diving ducks.

Disturbance impacts are not expected to increase the cumulative impact above that for oil spills alone.

**CONCLUSION:** The cumulative impacts on diving ducks are expected to be moderate.

### (3) Waterfowl

The status of most marine waterfowl in the Alaska and Pacific Regions is not known. Since these birds can show marked short- and long-term fluctuations (Drury, 1979), it is difficult to detect changes in population distributions and densities with precision from most current data. However, as none of the marine waterfowl species in the Alaska and Pacific Regions are being considered for listing as threatened, endangered, or candidate species, their populations are assumed to be stable. The following discussion focuses on the impacts to Arctic (Pacific) loons and western grebes which are used as representatives of marine waterfowl in the Alaska and Pacific Regions.

Compared to the mortality suffered by seabirds in gill and trammel nets (see discussion in Section IV.D.3.b.(4)), loons and grebes have experienced few impacts. In surveys, conducted by California Department of Fish and Game (CDFG) on incidental take of seabirds in gill nets, only 24 loons and grebes were taken during the period between 1983-86 (Collins et al., 1984, 1985, 1986; Volkovich et al., 1987; and CDFG, 1987).

Municipal discharges of organic pollutants into the ocean have had dramatic impacts on resident seabirds (see Section IV.D.3.a.(4) on impacts to brown pelicans). Certainly, loons and grebes pick up organic contaminants while wintering offshore in the Pacific Region (especially in the Southern California Bight); however, to date these contaminants have not been implicated in reproductive impairment on this or any other migratory waterfowl (Fay and Youatt 1967 as cited in McIntyre 1986; Frank et al. 1983).

The tendency of loons and grebes to aggregate in large numbers in nearshore waters (between 2-5 km (1-3 mi) of shore) makes them particularly vulnerable to nearshore oil spills. In all major oil spills offshore the Alaska and Pacific Regions loons and grebes made up a significant percentage of birds killed (see discussion of oil related seabird mortality in Section IV.D.3.b.(4)). (However, there is no indication that loons and grebes have experienced changes in distribution or abundance in the Pacific OCS despite the fact that they have been a significant component of the birds killed in previous spills.) Currently, the greatest risk of an oil spill impacting migrating or wintering marine waterfowl is in the Southern California Planning Area of the Pacific Region and the Gulf of Alaska in the Alaska Region. (As loons and grebes spend the breeding season on and near freshwater lakes in Alaska and Canada, they are largely unaffected by existing OCS activities in the Alaska Region. However, loons that nest on the Arctic coastal plain do frequent nearshore marine habitats to feed. They, therefore, can be impacted by nearshore spills or nearshore OCS activities.)

Most marine waterfowl that breed in Alaska and Canada either winter in the Gulf of Alaska or stage there prior to migrating further south. From existing oil and gas activities, birds in the Gulf of Alaska are exposed to the possibility of an oil spill. Also, birds that migrate further south could encounter another oil spill in the Pacific Region. However, an oil spill would have to contact a large number of birds in both areas in the same year to have an impact level greater than the existing low impact from other sources.

Spills occurring in both areas within 2-3 years (one generation) would increase impacts to a higher level. In summary, the impact factor which would most affect migratory marine waterfowl in the Alaska and Pacific Regions is contact with an oil spill. However, even though they have, in some instances, experienced significant losses from nearshore oil spills, their populations appear to be stable. It is estimated that marine waterfowl will experience low impacts from existing projects or proposals but maintain viable populations.

The increment of impacts contributed by normal operations resulting from the current and future 5-year programs are not expected to increase impact levels significantly from past, ongoing, and projected non-OCS activities and past and ongoing OCS activities. Potential impacts from normal activities, combined with existing marine vessel traffic, industrial discharges and commercial fishing on waterfowl would probably increase; but the duration of negative impacts are not expected to result in a change in the distribution and/or abundance in this species for more than 3 years.

With the addition of the oil and gas activities associated with the current and future 5-year programs, there is an increase in risk that an oil spill could occur and contact migrating or wintering birds in the Pacific Region and the Gulf of Alaska. Birds in the Gulf of Alaska are exposed to a slightly higher risk of an oil spill under the current and future 5-year programs (Table IV.B.4-2). Also, birds that migrate further south could encounter another oil spill in the Pacific Region. With a total estimated mean number of 12 oil spills for the Southern California Planning Area, this is the most likely place birds would be impacted. Given the oil spill estimates previously discussed, it is reasonable to assume that a major oil spill will occur in the southern California coastal area and contact some of the local marine waterfowl species. These oiled marine waterfowl are likely to suffer a high mortality rate from drowning or hypothermia, some of the birds will become sick and later die from ingesting oil, and some with lightly oiled feathers would probably survive. It is highly unlikely that multiple oil spills would contact all of the marine waterfowl habitat along the Gulf of Alaska and southern California coastal regions simultaneously, and a lesser possibility of occurring during a critical migration period, entering a coastal area, and contacting marine waterfowl on the water. An oil spill would have to contact a large number of birds in both areas in the same year to have an impact greater than low. Additional oil spills occurring in both areas within 2-3 years (one generation) could increase impacts to a higher level.

Most species are expected to maintain viable populations throughout the 40-year period. However, the potential for one or more major oil spills contacting birds along the Alaskan and/or California coast during migration has the potential to be locally high. The current and future 5-year programs are not expected to substantially increase the existing low cumulative impact on marine waterfowl.

**CONCLUSION:** The overall cumulative impacts on waterfowl are expected to be low.

#### (4) Seabirds

The distribution and abundance of many seabird species in the Alaska and Pacific Regions is not well documented. Although seabirds are adapted to survive in a harsh environment with an unpredictable food supply, they suffer major fluctuations in population numbers from year to year. Natural, annual, adult mortality is on the order of 10-15 percent (Lack, 1954:92; Henny



1972:44; Anderson and Gress, 1983:83). Since seabird populations show marked short- and long-term natural fluctuations (Drury, 1979), it is difficult to detect changes in population distributions and densities with precision from available data. Only the marbled murrelet (outside of Alaska) and the elegant tern are believed to be declining in population (DOI, FWS, 1989). The activity that has had the most recent negative impact on the seabird populations in the Alaska and Pacific Regions is gillnet and trammel net fishing. The following discussion on the impacts of gillnetting in the Pacific Region is based largely on Collins et al., 1984, 1985, 1986; Volkovich et al., 1987; and CDFG, 1987. In the Pacific Region, essentially all of the seabird mortality from this fishery took place offshore northern and central California. CDFG estimated that during 1980 to 1982 more than 20,000 seabirds were drowned in nets in Monterey Bay alone. CDFG estimated that some 50,000 seabirds (93% being murres) were drowned during 1983-1986 off northern and central California. This heavy mortality in central California is believed to be the major reason for the over 50% decline in common murre numbers from the late 1970's to 1986 (Takekawa 1988, pers. commun.).

In the Southern California Planning Area there only exist a small gillnet fisheries. Annual surveys by CDFG of the Southern California Bight indicate that gill and trammel nets have a negligible impact on seabird numbers, as there has only been 11-17 observed takes/year in the past 3 years.

The excessive seabird mortality in northern and central California prompted the State to restrict gill and trammel net fishing for the protection of non-target marine wildlife offshore northern and central California. Even if this legislation eliminates seabird mortality in central and northern California, it may take several years for some local populations of seabirds (especially murres) to recover.

The incidental take of seabirds in California is small compared to that which occurs in the Alaska OCS Region. In the northern North Pacific Ocean and Bering Sea, it has been estimated that some 250,000 to 500,000 seabirds are killed annually by the Asian (mostly Japanese and Korean) gillnet fisheries for salmon (King et al., 1979; Ainley et al., 1981). The majority of the birds taken are murres, shearwaters, and puffins. As King et al. (1979) noted, although the total standing seabird stock in Alaskan waters may be as high as 100 million birds, the few selectively caught species may be experiencing significant local impacts.

Major offshore oil spills pose a significant threat to seabirds. Of the eight well-documented oil spills in the Alaska and Pacific Regions which have killed large numbers of seabirds, seven involved tankers from non-OCS sources. In 1937, an oil spill from a grounded tanker killed a large number of alcids (primarily common murres), loons, grebes, waterfowl, shorebirds, and gulls (Aldrich, 1938; Moffitt and Orr, 1938). In 1971, two tankers collided at the entrance to San Francisco Bay; the 840,000 barrels of spilled oil killed an estimated 20,000 seabirds composed primarily of grebes, scooters and common murres (Smail et al., 1972). In 1984, the tanker *Puerto Rican* broke in half south of Southeast Farallon Island; the resulting 35,000 barrels of spilled oil killed an estimated 5,000 birds, of which nearly 90% were common murres (representing a loss of 5% of the breeding population of this species in the Gulf of Farallons) (PRBO, 1985). In 1985 a barge, the *Apex Houston*, spilled 616 barrels of oil killing about 10,500 seabirds, again targeting common murres (71%) and rhinoceros auklets (15%) (Page and Carter, 1986). In early December 1984 an unknown amount of oil from the sunken hull of the *Puerto Rican* came ashore in Marin County, oiling approximately 80% of the sanderling population near Bodega Bay. In late December of 1988 the barge *Nastucca* collided with its tugboat just offshore Grays Harbor in Washington and spilled some 5,500 barrels of bunker crude. Over 10,000 seabirds (mostly murres, scooters and grebes) were killed from this event.

In 1989, the tanker *Exxon Valdez* ran aground in Prince William Sound (PWS), spilling nearly 11 million gallons of North Slope crude oil. It is estimated this very large spill probably killed about 200,000 seabirds (CEC, 1989). Most of the mortality occurred among diving birds (e.g., murres, murrelets, and guillemots), with a low mortality among surface feeding birds (e.g., kittiwakes, storm-petrels, and gulls). About 88 percent of the seabird mortality occurred outside PWS. Common Murres concentrated at Barren Island for the breeding season were the local population most seriously effected by the spill. Of the dead birds recovered and identified, murres accounted for about 75 percent with other species of alcids contributing another 4 percent. More than 1 million murres breed in the Gulf of Alaska, which means that even a higher level murre mortality would not represent a threat to the species on a regional level (CEC, 1989). However, the excessive mortality of marbled murrelets and pigeon guillemots in the Prince William Sound area may represent a regionally significant proportion of their population in this area. Some large oil spills can cause excessive seabird mortality resulting in locally high impacts on some seabird species and regionally high impacts on species with small populations. From an inter-regional population point-of-view, seabirds have numbers in the hundreds of millions.

The impacts that certain municipal wastewater discharges and onshore effluent can have on seabirds were illustrated by the dramatic decline of California brown pelicans and cormorants due to discharges of pesticides into the coastal waters of southern California during the mid-1960's (see citation in Section IV.D.3.(4) for the California brown pelican). Although, there are a host of known contaminants in ocean sediments from discharges offshore, especially in southern California (Thompson, Hershelman, and Gossett, 1988; McCain et al., 1988), to date chlorinated hydrocarbons (DDT and its metabolites) and polychlorinated biphenals (PCBs) appear to cause more reproductive declines and failures in marine and coastal birds than any of the other contaminants (see citation in Section IV.D.3.(4) for the California brown pelican; Greas et al., 1973; and Faber et al., 1972). Following the ban on the dumping of these contaminants in the mid-1970's, some seabirds (brown pelicans in particular) began to experience a gradual comeback (Anderson et al., 1975). Heavy metals, unlike PCBs or DDT, have not been implicated in reproductive impairment of birds probably because none, except mercury in the organic form of methylmercury, bioaccumulate in the food chain.

Seabirds are currently experiencing effects from several severe impacting agents (e.g., drowning in gillnets, degradation and loss of breeding habitat, subsistence harvesting and disturbance of breeding colonies, adverse climatic conditions, alteration and reduction of prey-species populations, introduced predators on breeding colonies and chronic oil pollution). Cumulatively these impacts can be significant. These agents, singularly or in combination, are the reason certain seabird species have experienced population declines.

Offshore construction and other OCS-related operations (gravel and/or ice islands, mobile bottom-supported drilling platforms, drillships, drilling mud and cuttings, and installation of pipelines) will result in dredging and the deposition of mud, rock fragments, and gravel on the sea floor. The deposition of fill material and dredging activities will cause water turbidity and smothering of benthic organisms and result in a moderate effect on the availability of food organisms in the vicinity of these activities. These offshore operations are expected to have a low impact on the availability of food organisms for seabirds. Marine debris (plastics, styrofoam pellets, and discarded gillnets) from shipping, fishing, and onshore sources cause an undetermined loss of seabirds and a low level degradation of their marine environment (CEE, 1986).

Onshore construction and coastal development (marine terminals, processing facilities, pipelines, and commercial, municipal, and residential facilities, etc.) are not likely to be located in the vicinity of seabird breeding and/or nesting colonies, because seabird colonies are usually



located on islands, in isolated areas, or protected wildlife areas. However, marine debris, waste effluents, and air emissions from coastal facilities could directly and indirectly contaminate and/or degrade seabird breeding and foraging areas and prey species.

Noise and disturbance from air and vessel traffic and human presence associated with non-OCS sources and OCS-related activities in the vicinity of seabird breeding colonies, molting and foraging areas disrupts the normal behavior of seabirds. Disturbances of seabird colonies may result in nest desertion, reduction in feeding, flight to less desirable habitat, and mortality. Existing levels of disturbance are expected to have a very low level of effect on seabirds.

An oil spill can cause substantial (25-50 percent) short-or long-term reduction in local populations of some seabirds. The seabirds most likely to suffer direct mortality from oil spills are auklets, murres, and other species of alcids. Alcids, especially murres, form large concentrations on the water both at their breeding colonies and wintering areas, and they have suffered heavy mortality from oil spills. Murres are particularly susceptible to oiling because they dive and pursue their prey under water, also they dive under water when disturbed. The reproductive strategy of murres and other alcids with a low reproductive turnover combined with longevity and a long adolescent period, allows them to cope with some of the natural fluctuations in their environment. However, such a strategy makes the species slow to recover from additional man-induced mortalities (e.g., drowning in gillnets, subsistence hunting, oil spills, etc.). A higher level of effect on seabirds can occur if mortality is concentrated within only one or two species which have small depressed regional populations, especially species such as auklets, murrelets, and other alcids which may require more than one generation for the population to recover.

In general, the size of an oil spill may be less important than the actual location of the oil spill. Significant mortality can occur during migration and breeding periods because seabirds are concentrated near their breeding colonies. Seabird mortality is critically influenced by seasonal and climatic factors.

Other perturbations of the environment which affect the survival and productivity of seabird populations are likely to intensify any effects of oil and gas development. Chronic exposure to oil in the environment, together with other substantial sources of effects noted above, is likely to have the most significant long-term adverse effect on seabird populations, especially with regard to recovery from excessive loss of breeding individuals or low productivity resulting from various factors. These adverse effects could affect some seabird populations for up to one generation. Cumulatively these existing impact producing agents are estimated to selectively cause a moderate level of impact to some local and regional seabird populations (particularly alcid species).

With the addition of the OCS oil and gas activities associated with the current and future 5-year OCS programs, there is a potential increase in risk that oil spills could occur and contact migratory seabirds in Alaska and Pacific Regions. The planning areas with the highest estimated mean number of oil spills associated with current and future OCS programs are the Chukchi Sea (7), the Navarin Basin (13), the St George Basin (4), and the Southern California (7) Planning Areas (see Table IV.B.4-2). While many seabirds do not undertake extensive migration (as compared to certain shorebirds and waterfowl), some do migrate through or overwinter in or near other OCS planning areas and therefore could be subject to increased oil spill risk from oil and gas development in these other areas.

Ten potential OCS oil spills are estimated to occur in the Beaufort (3) and Chukchi (7) Seas over the 35- to 40-year time period. Major seabird breeding colonies are located south of Cape Lisburne in the Chukchi Sea Region. If oil spills contacted seabird breeding colonies and/or foraging areas in this region, a moderate effect on local populations of murres, auklets,

and other alcids could occur. If a large oil spill occurred in the Bering Straits during the fall when thousands of molting least and crested auklets were present on the water, mortality would be high and regionally high effects could occur to these species.

St. Matthew and Hall Islands probably have the largest number of breeding seabirds (mostly murres and auklets) in the North Pacific Ocean. These islands would most likely be affected by a large oil spill from oil development or transportation occurring in the Navarin Basin. The seabird colonies on the Pribilof Islands and in the vicinity of Unimak Pass would most likely be affected by large oil spills resulting from oil development in the St. George Basin, and the transportation of oil produced in the Navarin Basin or other northern areas. Since an oil spill in winter would most likely be incorporated into the ice to be released in the spring, a large oil spill at almost anytime of the year, in this region of the Bering Sea, could impact hundreds of thousands of breeding and foraging seabirds. Since most seabirds migrate south with the onset of ice formation they could also be exposed to large oil spills in the southern Bering Sea, Unimak Pass, and/or Gulf of Alaska (9 oil spills are estimated from non-OCS sources and 8 spills are estimated from OCS-related activities, see Table IV.B.4-2) as they migrate toward the Pacific northwest.

In summary oil spills from OCS development and transportation in the Bering Sea Region could have high effects on some seabird species if multiple spills resulted in the loss of several thousand birds from the same colony before the population was able to recover from previous losses. Alcid species could suffer long-term population declines through the loss of breeding birds.

Eleven non-OCS oil spills and 9 OCS-related spills are estimated to occur in the Pacific Region (Washington, Oregon, and California), over the 35- to 40-year period of this program (see Table IV.B.4-2). It is reasonable to assume that one or more large oil spills could impact breeding and/or foraging seabirds in the vicinity of the Farallon or Channel Islands as a result of oil and gas development related to the current and future 5-year programs. This could result in the loss of a large number of seabirds, cause sublethal impacts of depressed breeding activities or disruption of that season's breeding effort. The effects of such a spill could change the distribution and abundance of some alcid species at the regional level. The duration of this effect could be within one generation and result in a moderate impact.

Because most seabird species are widely distributed, it is unlikely that a seabird species will be jeopardized over a large portion of its migratory range from one or more oil spills. Recruitment of birds from unaffected parts of a regional population is likely to replace lost individuals from local areas within a generation. The potential effect of an increased number of spills associated with current and future programs occurring would be to elevate the level of effect by increasing the portion of a population contacted by oil. If multiple oil spills are assumed to contact a seabird breeding colony, molting area, and/or foraging area and resulted in the loss of several thousand birds from the same colony before the population was able to recover from a previous loss, significant effects on the regional seabird populations would occur depending on which species suffered the greatest mortality. Alcid species (e.g., murres, murrelets, and auklets) could suffer long-term population declines through the loss of breeding birds and require several generations to recover. However, it is unlikely that two or more large oil spills, either non-OCS or OCS-related, would contact the same seabird population within a 3-5 year time period.

However, multiple oil spills were assumed to occur in areas where major seabird populations (e.g. the region of St. Lawrence, St. Matthew-Hall, Pribilof, Kiska, and Buldir Islands; Unimak Pass and Semidi, Forrester and Farallon Islands) are coincident with a high cumulative risk of non-OCS and OCS-related oil spill contact (e.g., the Chukchi Sea, Navarin Basin, Gulf of Alaska, and Southern California). Therefore, it is likely that moderate to high effects could be



experienced by alcid species seabird populations in the Bering Sea Region. Overall, it is expected that most seabird species will maintain viable populations and experience moderate impacts without the current and future 5-year programs. The addition of the current and future 5-year programs is not expected to increase the existing moderate cumulative impact on very abundant species of seabirds. However, some species of auklets, murrelets, and other alcids in the Bering Sea Region, could experience high cumulative effects, and requiring two to three generations to recover.

**CONCLUSION:** The overall cumulative impacts to seabirds from non-OCS and OCS activities are expected to be moderate for most seabird populations except for small populations of some species of auklets, murrelets, and other alcids in the Bering Sea Region. Impacts to these seabird species are expected to be high.

#### (5) Shorebirds

Like seabirds, shorebirds show dramatic short- and long-term fluctuations in numbers (Prater, 1979:162; Page et al., 1979:25). Therefore, estimates of population size, even when taken over long periods, can be misleading as to the true status of the species. However, since only the snowy plover (*Charadrius alexandrinus nivosus*) and long-billed curlew (*Numenius americanus*) are candidates for listing as threatened or endangered (DOI, FWS, 1989) - all other species of shorebirds are assumed to have at least stable populations. (The eskimo curlew (*N. borealis*) is listed as endangered but is believed to be extinct; the last confirmed sighting was in 1972.)

In the past shorebirds have experienced heavy hunting pressure. During the late 1800's and early 1900's shorebirds were legally hunted by market hunters for their plumage throughout North America. Birds were killed by the thousands as they concentrated on staging areas during their migration. Some populations are estimated to have been reduced by 50 to 95 percent. This excessive overhunting is believed to be the cause of the virtual extinction of the once common Eskimo curlew (Banks, 1977). Since market hunting became illegal in 1900 through 1920 (through a series of Federal and State laws), most shorebirds have recovered; but it is impossible to determine to what extent (Harrington, 1986).

Currently, adverse impacts to most shorebirds come primarily from the loss of winter and migratory habitat due to coastal development. (However, the decline in numbers of long-billed curlews and snowy plovers is mainly due to destruction of breeding habitat.)

As mentioned in section III.A.3.b.(5), shorebirds concentrate in large numbers on staging areas during their migration. While on the staging area, birds feed intensively to store up fat which is used to "fuel" their subsequent non-stop flight to the next staging area, which in some cases can be thousands of miles apart separated by unsuitable habitat (Odum et al., 1961; Senner, 1979). For this reason, it is believed that these staging areas are critical to shorebirds and that their loss could result in reduced population numbers through starvation on wintering grounds and/or reduced productivity on breeding grounds (Goss-Custard, 1977, 1979; Senner, 1979). Loss of coastal wetland habitat to commercial and residential development is nowhere more evident in the Alaska and Pacific Regions, than in California. Speth (1979) reported that the state of California has lost some 261,000 acres (almost 70%) of its coastal wetlands since the early 1900's to a variety of coastal development projects. With human population growth expected to remain constant or increase (especially on the Southern California coast) at best there could be no further net loss of habitat for migrating shorebirds over the life of the project. In this case shorebirds would maintain viable populations and impacts experienced would be low.

A major oil spill that comes in contact with a coastal wetland or estuary has the potential to impact thousands of shorebirds. Further, since most shorebirds tend to feed above the water-line (as opposed to wading and swimming), they generally would not come in direct

contact with oil spilled, though their food source could be greatly affected. Therefore, relative to seabirds, shorebirds are less vulnerable to oil spills. Nevertheless, in those instances where shorebird habitat has been contacted by oil, shorebird kills have been significant (Harrison, 1967; Page and Carter, 1986).

Shorebirds are most vulnerable to the impacts of spilled oil on their breeding areas and wintering areas because they remain there throughout the season (as opposed to being on the staging areas for only a few weeks). Birds wintering in southern California are exposed to the greatest risk of an oil spill from existing sources. Since shorebird habitat is located throughout the Southern California Planning Area along the coast and since birds are present throughout much of the winter and fall (either wintering or staging), it is reasonable to assume that at least one oil spill will occur and contact shorebird habitat when birds are present. Another oil spill would have to occur and contact birds on the same wintering grounds within 3-5 years or on one of the staging areas in the same year (when birds are present) to have an impact greater than low. However, assuming uniform distribution of the oil spills over the next 35 to 40 years, it is unlikely that another oil spill would occur and contact the same wintering ground or staging area.

In summary, the major existing impact producing agents affecting shorebirds is the destruction of coastal habitat. While shorebirds are vulnerable to the impacts of spilled oil, relative to seabirds, they have experienced fewer impacts from most oil spills (Bourne, 1968: Table 2). From existing projects and proposals, it is expected that shorebirds will maintain viable populations and experience low impacts.

The increment of impacts contributed by oil and gas activities associated with the current and future 5-year programs are not expected to increase existing levels substantially, because there are no lethal impacts associated with drilling discharges, increased noise levels, or disturbance from vessel traffic which could result in impacts requiring greater than one year recovery time. Potential impacts from normal activities, combined with existing marine vessel traffic and industrial discharges, on coastal birds would probably increase but remain sublethal impacts.

A major consequence of the current and future 5-year programs on shorebirds is the increased risk of an oil spill occurring and contacting habitat in the Alaska and Pacific Regions. In the Alaska Region this project introduces the risk of an oil spill in planning areas where no risk previously existed. In the Pacific Region it generally only increases the risk of an oil spill occurring. The planning areas with the highest estimated mean number of oil spills are the Navarin Basin, the Gulf of Alaska, the Chukchi Sea, and the Southern California Planning Areas.

A large oil spill in the Navarin Basin is most likely to impact shorebirds in the Y-K Delta (in the St. Matthew Planning Area). This area is the most productive waterfowl and shorebird breeding area in North America. Since an oil spill in winter would most likely be incorporated into the ice to be released in the spring, a large oil spill at almost anytime of the year could impact thousands of breeding shorebirds. As most breeding birds migrate south with the onset of ice formation, they could also be exposed to a large oil spill in the Gulf of Alaska (see Table IV.B.4-2) as they stage in the Prince William Sound Area (mostly in the Cooper River Delta) prior to migrating further south. Essentially the same is true of coastal birds in the Chukchi Sea. Additionally, shorebirds like dunlins and sandpipers that migrate as far south as the Southern California Planning Area (see Table IV.B.4-2) could be exposed to an additional risk.

Based on the length of time birds spend in the following areas and the importance of the areas in their life cycle, it is assumed that an oil spill will occur and contact two of the three following sensitive shorebird areas within 1-3 years when shorebirds are present: 1) the Y-K Delta from



an oil spill originating in the Navarin Basin Planning Area; 2) the Cooper River Delta from an oil spill originating in the Gulf of Alaska; and 3) a coastal wetland the southern California (e.g. Morro Bay, Mugu Lagoon, or Goleta Slough). Based on the oil spill assumption for this analysis, locally high impacts would be estimated from a single large oil spill that contacts shorebird habitat in any one of the planning areas in the Alaska and Pacific Region. The current and future 5-year programs are not expected to increase, the overall existing low cumulative impact on shorebirds.

**CONCLUSION:** The cumulative impacts of OCS and non-OCS activities are expected to be low to shorebirds.

### 3. Fish Resources

#### a. Pacific Salmon

##### (1) Alaska Region

Alaska Pacific salmon resources range through all of the planning areas off Alaska but are not as numerous in the Beaufort, Chukchi, Hope, and Navarin Basins. Because of repeating adverse environmental conditions and lack of long-term management, Alaskan salmon populations were historically over-exploited and sometimes reduced to dangerously low levels. Current management administration has largely removed the majority of problems; thus the populations may now be at optimum management levels, that are consistent with available habitat at sea and in freshwater spawning/rearing areas. Although Alaskan salmon populations are generally at high levels, there are areas where the numbers are below optimum levels. These areas are localized and short-term, and the reductions are usually for a single species; for example, the Chignik sockeye salmon run on the south Alaska Peninsula was reduced from former high levels in 1988, as was the Kodiak Island pink salmon run).

Commercial fishing for salmon, a major industry in Alaskan waters, has significant impacts on salmon population levels. While salmon stocks were once overfished, improved fisheries management now limits over-exploitation; and these species are now managed to provide maximum sustained yield. The illegal and incidental catch of salmon by foreign fleets in the eastern Bering Sea may also have a significant impact on salmon numbers. However, there is no information available as to the current total catch, and impacts are difficult to quantify.

Logging, placer mining, dredging and filling, and pollutant discharge in waters where salmon migrate, spawn, and grow prior to their seaward migration may also have some adverse impacts on salmon populations. Increased siltation from erosion caused by careless logging, placer mining, or construction activities could result in a reduction in egg and fry survival and/or a reduction in available spawning habitat, leading to a decline in overall productivity for affected streams. In Alaska, these types of activities are localized and tend to affect only small segments of the Statewide salmon habitat. Presently, there are no means to accurately quantify these impacts, given the limited scope of these operations and their comparatively limited number. The overall cumulative impact of these activities on the salmon populations, Statewide, are estimated to be very low. However, they can have severe impacts in the limited area where the activity occurs.

Seismic survey activities as a result of existing oil and gas exploration are expected to consist primarily of site-specific high resolution surveys or localized deep penetration surveys. See Section IV.D.3.a(2) for a discussion on the potential impacts of seismic survey activities for Pacific Salmon. Other activities that could have some effect on salmon populations would be exploratory drilling on tracts leased in prior lease sales. Currently, there are no immediate plans for companies to drill on leases within the major distribution range of Pacific salmon populations. There are, however, a number of active leases on which oil companies could drill.

If drilling does occur, salmon would be most greatly at risk from large accidental oil spills. However, of the more than 8,000 exploratory wells that have been drilled on the OCS, no large accidental oil spills have occurred. If a discovery is made, the risk to salmon would increase during development and production activities.

To affect salmon, an oil spill would need to contact the fish and/or their food supply. Salmon, both immature smolts and spawning adults, usually occur in marine waters at depths of 1-5 fathoms (6-30 ft), and their schools do not constitute closely-concentrated bands, but rather separate groups that are constantly changing density and configurations in response to various conditions. Many researchers have studied the direct effects of petroleum hydrocarbons on Pacific salmon and have reported lethal and sublethal responses (Rice, 1979; Malins et al., 1981; Moles et al., 1979; Brocksen and Baily, 1973; and Weber et al., 1981).

Salmon are migratory with limited time in a given area; hence, the probability of being contacted by an oil spill for an extended period of time is very low. Even a large oil spill, either offshore or coastal, would contact only a small portion of the pelagic salmon habitat. Salmon also seem to be able to detect some hydrocarbons in the water and to divert from these areas. However, if the spill occurs along the spawning migration route or at the mouth of spawning streams, diversion from an oil spill could affect the spawning success of that population. Although salmon are concentrated in the upper portion of the water column, where they are likely to come in contact with a slick or the water-soluble fraction around and beneath it, hydrocarbon concentrations in open-water areas are generally well below 1 ppm. Researchers have reported that adult salmon experience mortality following exposure to concentrations in excess of 3 ppm. Consequently, mortalities would be limited in number, although any sublethal effects would be difficult to quantify. Therefore, because of the limited amount of habitat which may be affected, and the typical concentration of water-soluble hydrocarbons, it is estimated that overall impacts from an accidental oil spill would be very low.

Oil and gas activities associated with the addition of the current and future 5-year programs that might have impacts on salmon are: (1) oil spills, (2) drilling discharges, (3) pipeline installation, and (4) onshore construction associated with offshore exploration and development. These additional activities might cumulatively affect salmon on the high seas and on their spawning and rearing areas over a 40-year period. During the course of offshore exploration and development off Alaska, more than 600 exploration wells and 52 production platforms are projected to be established (Table IV.B.1-1). Based upon historic spill rates, it is estimated that about 42 oil spills of 1,000 bbls or greater might occur (see Table IV.B.4-2). The oil spills are assumed to be equally distributed over the entire 40-year period of these projects and over the entire Alaska OCS. Because of the long time period over which the spills may occur and the extensive ocean area involved, the probability of contacting a significant portion of salmon, their habitat, or food supply is very low. Even given multiple oil spills within the same year, only a small portion of the Statewide salmon populations would be contacted. Impacts of oil spills on salmon have been previously described and have been shown to be very low.

Drilling discharges also have components that would prove toxic to salmon, with the number of wells drilled releasing large weights and volumes of these materials into ocean waters and to the benthos. While sublethal to lethal impacts of these materials have also been substantiated by studies, the benthic area affected by them is not within the depths at which salmon normally migrate; the area contacted by the discharges is comparatively small, usually measured in hundreds of square meters.

Pipeline installation requires some excavation/disturbance of the ocean bottom with resultant turbidity. This is a temporary impact that dissipates very rapidly, and the turbidity should not extend to the pelagic waters where salmon migrate and rear. Onshore construction of pipelines,



petroleum holding/processing facilities, and support installations could affect salmon spawning/rearing streams; however, development planning can prevent these impacts through siting away from salmon streams.

**CONCLUSION:** Overall, the cumulative impact of OCS and non-OCS activities on Pacific salmon in the Alaska Region is expected to be very low.

## (2) Pacific Region

According to the PFMC (1982, 1984), in the early 1980's, the long-term trend for many salmon stocks in the Pacific Region was towards lower levels of abundance. In 1981, for example, most stocks of chinook and coho salmon in the Pacific Region were considered to be in a depressed condition, and were exhibiting a declining trend in abundance. More recent information (PFMC, 1989) on the statuses of major chinook, coho, and pink salmon stocks from the rivers within the Pacific Region indicates that at least some populations or runs have increased in abundance over the past several years as a result, in part, of stringent management efforts by the PFMC.

Long-term cumulative impacts may occur to migratory salmon stocks originating in rivers of the Pacific Region as a result of existing and future non oil-related factors or activities. The principal non oil-related factors or activities that may impact migratory salmon stocks over the next 35 years include natural fluctuations in environmental conditions (e.g., freshwater runoff and stream flows, ocean temperatures, and food supply, etc.) which affect the survival of all life-history stages. These impacts include mortality of juvenile and adult salmon resulting from commercial and sport fishing activities, and the loss and/or degradation of freshwater spawning and nursery habitat. Juvenile salmon production has also been shown to be affected by various onshore activities such as hydroelectric power projects, water diversions for agriculture and development, and various timber and construction activities.

Commercial, sport, and tribal Indian fishing for Pacific salmon produced from rivers in the Pacific Region are expected to continue over the next 35 years in marine waters offshore the States of California, Oregon, and Washington; offshore British Columbia; possibly offshore southeast Alaska and in the Gulf of Alaska; and to a lesser extent in the freshwater rivers producing the stocks. Although the relative contributions to total fishing mortality from these various sources of fishing pressure are not clear, the most intense fishing pressure on salmon stocks is expected to occur in the Exclusive Economic Zone (EEZ) that is regulated by the PFMC offshore California, Oregon, and Washington. Historical PFMC landings data for salmon taken in the EEZ of the Pacific Region indicate that the annual commercial and sport catch (i.e., fishing mortality) of chinook, coho, and pink salmon can vary substantially (PFMC, 1989). The magnitude of future salmon harvests by commercial and sport fisheries in the Pacific Region is expected to be highly variable, but generally falls within the range observed since the PFMC began regulating ocean salmon fisheries in the late 1970's.

The impact of existing and future commercial, sport, and other types of fishing pressure on salmon populations is difficult to estimate. In large part, the impact of fishing pressure on the abundance of salmon stocks will be based on the accuracy of PFMC pre-season salmon abundance estimates, and the effectiveness of PFMC management measures that are designed to control fishing pressure and harvest levels so that spawning escapement goals can be achieved and stock sizes maintained or increased. Although a major goal of PFMC management efforts is to avoid overfishing and achieve spawning escapement goals, it is very likely that some degree of overfishing will occur several times over the next 35 years because of the difficulty in accurately assessing the abundance of spawning runs and then allocating the available fish among competing fisheries and escapement. Reductions in the abundance of

specific salmon stocks are expected to result from this overfishing, but the impacts are expected to generally last from 1-5 years at most because of ongoing PFMC management efforts.

Significant reductions have occurred historically in the spawning and rearing habitats available to salmon populations originating from rivers throughout the Pacific Region. As a result of these habitat losses, significant long-term reductions in salmon populations have occurred throughout the Region over the last 20-50 years. These reductions in salmon stocks or populations have been so significant that in some instances commercial fisheries have been closed or significantly curtailed, and one particular chinook stock (the Sacramento River winter run) has been declared threatened by the National Marine Fisheries Service. Some of the activities (e.g., hydroelectric plant operations, water diversions, etc.) that have created these historical reductions in habitat or cause mortality to, and reductions in, juvenile populations are likely to continue in the future. It is also possible that additional new projects or activities will contribute to this chronic problem.

Because the abundance of salmon runs and populations are, at least in part, related to the productive capacity of spawning and rearing habitats, habitat changes over the next 35 years are expected to influence the abundance of salmon populations. Based on projections made in the early 1980's by the PFMC (1981), habitat availability for many rivers in the Pacific Region, with or without rehabilitation efforts, was expected to remain relatively unchanged over the next 10-20 years, except for marginal improvements in rivers supporting some stocks. As noted above, for example, some of the existing activities that have caused habitat reductions in some areas are likely to continue in the future, and thus continue to impact the salmon stocks that rely on the habitat. Since restoration efforts are currently underway to restore stocks in some river systems within the Region, however, improvements in habitat and abundance can be expected for some stocks over the next 35 years. For example, the Northwest Power Planning Council's Columbia River Basin Fish and Wildlife Program has established a target of doubling the salmon (and steelhead) runs of the Columbia River. This program includes measures to increase fish passage and to enhance and restore habitat. Such measures are likely to make a significant contribution to the restoration of some Columbia River salmon stocks. Thus, long-term trends in the availability of habitat for Pacific Region salmon over the next 35 years is expected to vary between stocks, depending in large part on whether rehabilitation or restoration efforts are conducted to improve habitat availability and reduce other existing impacts on the stock. However, those stocks that continue to be impacted by existing activities over the next 35 years, and are not rebuilt through restoration or rehabilitation efforts, may be particularly susceptible to the cumulative impacts from other non-oil or oil-related activities.

Long-term cumulative impacts may occur to migratory salmon stocks as a result of both existing and approved oil-related activities. The principal agents that could potentially affect migratory salmon stocks over the next 35 years as a result of existing and approved oil/gas activities include seismic survey activities and drilling discharges in southern California, platform and pipeline oil spills from exploration and development activities in southern California, and oil spills from TAPS and foreign import tanker activity throughout the Pacific Region, as well as the Gulf of Alaska.

Seismic survey activities in southern California over the next 35 years as a result of existing oil and gas exploration and development are expected to be relatively limited in number, and consist primarily of site-specific high resolution geohazards surveys and to a lesser extent localized deep penetration surveys. These surveys are expected to occur primarily in the Santa Maria Basin and Santa Barbara Channel over the next 10-15 years as exploration and/or development of existing leases take place.

Based on existing literature, airgun discharges from such surveys are expected to harm few, if any, juvenile or adult fish, including salmon smolts, even if they are exposed to airgun



discharges at distances as close as 1 meter from the source (Falk and Lawrence, 1973; Weaver and Weinhold, 1972). Recent field studies (Greenridge Sciences Inc., 1985; Dalen and Knutsen, 1986; Battelle and Bolt Beranek and Newman [BBN], 1987) have been somewhat equivocal but indicate that the localized distribution and abundance of rockfish and possibly other species may be very temporarily affected somewhat in response to acoustic signal exposure from airgun sources. Recent studies by Tracor Applied Sciences (1987) and Battelle Memorial Institute (1988) have also indicated that the eggs and/or larvae of at least one species of fish (northern anchovy) and one species of shellfish (Dungeness crab) are largely unaffected by airgun discharges, except possibly when individuals are exposed to these discharges repeatedly within the very near field (i.e., within approximately 1-3 meters) of the airgun source. The results of these studies all suggest that the prey organisms of migratory salmon are unlikely to be significantly affected by seismic survey activity.

Based on available information, impacts to salmon from seismic surveys are expected to be very localized and short-term changes in abundance, lasting on the order of several minutes during periods of seismic activity to several hours at most. The prey organisms of salmon are not expected to be affected by seismic activities, and thus the distribution and abundance of salmon is not expected to be affected by changes in prey distribution or abundance. The seasonal abundance of migrating Pacific salmon in southern California is relatively low compared to other areas in the Pacific Region; however, salmon can be expected to appear where seismic survey activities will occur over the next 35 years. Migrating salmon are expected to be relatively dispersed while in southern California; thus only a portion of the fish in the area are likely to be affected by acoustic discharges. Based on existing information, acoustic discharges from existing and future seismic survey activity may cause localized and temporary (minutes to hours) changes in the distribution of salmon migrating through the Santa Maria Basin and Santa Barbara Channel; however, such activities are not expected to cause any discernible lethal impacts that would reduce the abundance of salmon populations.

Drilling discharges (i.e., drill muds and cuttings) are expected to occur in southern California from exploratory, delineation, and production wells over the next 35 years from existing leases within the area. The exploratory, delineation and production wells are expected to be drilled in the Santa Maria Basin and Santa Barbara Channel over the next 10-15 years. Discharges from exploratory and delineation wells are expected to occur over a relatively short period of time (i.e., 1-3 months), whereas discharges from production platforms are expected to occur intermittently over a period of several years as multiple wells are drilled from each production platform.

Approximately 90 percent of the volume of the muds and cuttings discharged from a drilling vessel or platform settle to the seafloor rapidly. The remaining 10 percent, which are typically the smaller particles, form a surface or near surface plume which largely dissipates within 1,000 m of the discharge point. Neff (1985) reviewed substantial literature that indicated drilling muds or fluids are rapidly diluted within several meters of a discharge location, and that these discharges generally result in no short-term or acutely lethal impact to marine organisms. The relative abundance of migrating Pacific salmon in southern California is low compared to other areas in the Pacific Region. Salmon, however, can be expected to occur seasonally in this area. The salmon are expected to be relatively dispersed; thus, only a small number of the fish are likely to come into contact with these intermittent and rapidly diluted discharges.

Any exposure of salmon to these discharges is expected to be limited in duration since the discharges occur only periodically, influence only a relatively small area, and remain in the water column for only a short time. Temporary exposure of migrating salmon to these drilling discharges may result in localized and short-term (minutes to hours) changes in distribution if fish avoid the discharge plume; however, such discharges are not expected to cause any

discernible lethal impacts that would result in a decline in the abundance of salmon populations. It is possible that prey organisms of migrating salmon may be temporarily influenced by periodic drilling discharges as well, and as a result the localized distribution of migrating salmon may also be influenced.

A total of 21 oil spills are estimated to occur from the Gulf of Alaska to southern California over the next 35 years from the following activities: existing or approved oil and gas activities in southern California, tanker activity in the Gulf of Alaska (i.e., TAPS oil production), and tanker activity (i.e., TAPS and foreign imports) offshore Washington, Oregon, and central and southern California (see Table IV.B.4-2). Only three of these oil spills, however, are estimated to occur from either platforms or pipelines in southern California. The remaining oil spills are estimated to occur as a result of tanker activity.

The life-history stages of Pacific salmon stocks that are expected to be most sensitive and vulnerable to oil exposure are outmigrating smolts, nearshore feeding juveniles, and adults that are beginning to ascend their home rivers to spawn (Wilson, 1972; Rice et al., 1975; Moles et al., 1979; American Petroleum Institute, 1984; Malins et al., 1978; Nakatani et al., 1985, 1986; and Brannon et al., 1986). These life history stages typically occur in estuaries, or in shallow, nearshore areas that are in relatively close proximity to the home river of the population. Outmigrating smolts and juveniles occurring nearshore may be directly affected by exposure to oil resulting in mortality or sublethal effects that reduce survivorship. In addition, however, these stages may also be adversely affected indirectly if their prey organisms are affected by exposure to oil and reduced in abundance. Reductions in prey abundance from an oil spill may reduce the growth of juvenile salmon and eventually result in reduced survivorship. In contrast, pelagic juveniles or adults that are migrating in offshore waters are much less likely to come into contact with spilled oil in significant numbers, because they are generally dispersed widely offshore and in the water column.

Salmon stocks originating in the Pacific Region are primarily expected to be affected by oil spills that occur and contact those areas where salmon producing rivers are located (i.e., Washington, Oregon, and northern and central California) since the most sensitive life history stages of salmon will be located in these areas. In contrast, oil spills that occur in the Gulf of Alaska or southern California are not expected to significantly affect salmon stocks originating in Washington, Oregon, or California because the life-history stages of these stocks that are most sensitive to oil spills typically do not occur in these areas.

Over the next 35 years, a total of six oil spills are estimated to occur in those areas where sensitive and potentially vulnerable life stages of salmon also occur. Three of these oil spills are estimated to occur offshore Washington and Oregon, with another three occurring offshore central California (see Table IV.B.4-2). These oil spills are expected to occur from tankers transporting TAPS or imported oil, rather than from existing oil and gas facilities. For the purposes of this analysis, it is assumed that these oil spills will occur with an even or uniform distribution among seasons and over the next 35 years, and that two spills will occur within one year in two different planning areas. Based on these assumptions, therefore, these expected tanker oil spills are assumed to occur in different seasons approximately once every 10-12 years offshore Washington, Oregon, and central California, with two spills occurring in one year in two different areas (assumed to be Washington and central California). Each of these oil spills is assumed to contact and affect sensitive life stages (i.e., smolts, juveniles, and/or prespawning adults) of salmon occurring in estuarine or nearshore marine habitats adjacent to productive salmon rivers since these life stages are expected to occur throughout the year in many areas.

As discussed previously, these oil spills are expected to affect salmon populations by causing direct mortality of outmigrating smolts or juveniles, reducing the survivorship of outmigrating smolts or juveniles, reducing the abundance and/or availability of prey utilized by smolts or



juveniles, or reducing the spawning escapement of adult salmon through "straying" or delays in spawning runs. This reduction in smolt/juvenile production or spawning escapement could result in a future decline in the abundance of returning spawners. The magnitude of this decline is expected to be highly variable, but is expected to be related to the degree of oil contamination that occurs, the duration of the contamination, the coastal area and number of productive river systems affected, and the proportion of total smolt production and/or the spawning adult population that is affected.

The impacts to salmon from individual oil spills are generally expected to be localized unless a large number of productive rivers and streams, or a major river system (e.g., Columbia River) is affected. In this hypothetical case where two oil spills occur in a single year (e.g., Washington and central California) and sensitive life-history stages are affected, the overall impacts to salmon are expected to be greater since a larger area and more salmon populations will likely be affected. Since salmon produced in any 1 year generally spend from 1-5 years (depending upon the species and/or stock) maturing before returning to spawn, their contribution to future spawning runs will also be largely spread over a 1- to 5-year period. For this reason, the greatest decline in abundance of future spawning runs or populations from the impacts of one or even two oil spills in different areas is generally expected to be spread primarily over a period of 1-5 years following the oil spill event. However, for those salmon stocks (e.g., chinook and chum) in which the spawning run is dominated by only a few, or one, year class (e.g., 3- and/or 4-year old fish), or where the run consists of essentially a single year class (e.g., pink salmon), the decline in abundance of future spawners may occur for periods in excess of 5 years, and thus the impacts would be greater. In some cases, reductions in spawning runs may require 2-3 brood cycles, or from 4-12 years, to recover fully.

Both the magnitude and duration of oil spill impacts to salmon populations may be somewhat buffered in those cases where several year classes, and not just the year class affected by a prior oil spill, contribute significantly to future spawning runs. However, for those stocks where only a few, or one, year class dominate the spawning run, it is unlikely that other contributing year classes will substantially buffer oil spill impacts. Since individual oil spills in Washington, Oregon, and central California from tanker activity are estimated to occur at intervals of approximately 10-12 years over the next 35 years, and the duration of impacts from individual oil spills is estimated to be 1-5 years, and possibly up to twice that long, the impacts of multiple, widely-spaced oil spills on salmon populations from this Region are not expected to be overlapping or cumulative.

The principal non oil-related factors or activities that may reduce migratory salmon stocks with the addition of the current and future 5-year programs over the next 35 years are the same as those discussed above. In addition, other factors influencing salmon stocks include natural fluctuations in environmental conditions (e.g., freshwater runoff and stream flows, ocean temperatures, and food supply) which affect the survival of all life-history stages. These impacts include mortality of juvenile and adult salmon resulting from commercial and sport fishing activities, and the loss and/or degradation of freshwater spawning and nursery habitat. Salmon production can also be affected from various onshore activities such as hydroelectric power projects, water diversions for agriculture, and various timber and construction activities. The impacts of these factors and/or activities on migratory salmon stocks originating in the Pacific Region with the addition of the current and future 5-year programs are expected to be the same as those discussed above associated with past, ongoing and projected non-OCS activities, and past and ongoing OCS activities.

Long-term cumulative impacts may occur to migratory salmon stocks as a result of existing, approved, and future OCS activities, as well as existing and future non-OCS oil-related activities. The principal activities which could potentially affect migratory salmon stocks

include seismic survey activities and drilling discharges from oil- and gas-related activities, oil spills resulting from development activities (platforms and pipelines), and oil spills from related tanker (i.e., TAPS and foreign imports) activity throughout the Pacific Region and the Gulf of Alaska.

Seismic survey activities in the Pacific Region and the Gulf of Alaska are expected to consist primarily of prelease deep penetration surveys covering large areas, and postlease site-specific high resolution geohazard surveys (for exploration, development, and pipelines) over the next 35 years with the addition of the current and future 5-year programs. Prelease surveys are expected to occur throughout the Pacific Region and Gulf of Alaska, generally preceding lease sales, whereas the majority of high resolution surveys are expected to occur in southern California as a result of exploration and development.

Migrating juvenile or adult Pacific salmon originating from rivers located primarily in Washington, Oregon, and northern and central California are expected to occur in offshore areas in the vicinity of seismic survey operations throughout the Pacific Region and the Gulf of Alaska over the next 35 years. As discussed for the hypothetical case from existing activities, however, available studies indicate that acoustic signals produced by airguns and other devices used in seismic surveys are expected to harm few, if any, fish directly (unless they are in extremely close proximity to the airgun source), have no adverse effect on salmon prey organisms, and thus result in little more than localized and temporary changes in distribution or abundance of some migratory fish. Therefore, oil- and gas-related seismic surveys throughout the Pacific Region and the Gulf of Alaska over the next 35 years may cause localized and temporary (minutes to hours) changes in the distribution of migrating salmon, but are not expected to cause any discernible lethal or long-term impacts that would reduce the abundance of salmon populations.

Drilling discharges (i.e., drill muds and cuttings) are expected to occur in the Gulf of Alaska and throughout the Pacific Region from exploratory, delineation, and production wells drilled over the next 35 years with the addition of the current and future 5-year programs. As with seismic survey activities, the vast majority of these wells are expected to be drilled in southern California. Discharges from individual exploratory and delineation wells are expected to occur over a relatively short period of time (i.e., 1-3 months), whereas discharges from production platforms are expected to occur intermittently over a period of several years as multiple wells are drilled from individual production platforms.

Although migrating salmon are expected to pass through areas where drill muds and cuttings are discharged over the next 35 years, not all fish passing through an area with drilling are likely to come into contact with these materials since fish are expected to be relatively dispersed, discharges are expected to occur intermittently, and discharges are expected to be diluted rapidly and influence only small areas. Exposure to these discharges, if it occurs at all, is also expected to occur for only short periods of time as discussed previously. As discussed previously, the available literature indicates that these types of drilling discharges generally result in no short-term or acutely lethal impacts to marine organisms, including fish. Thus, temporary exposure of migrating salmon to these drilling discharges may result in localized and short-term (minutes to hours) changes in distribution if fish avoid the discharge plume; however, such discharges are not expected to cause any discernible lethal impacts that would result in the reduced abundance of salmon populations. It is possible that prey organisms utilized by migrating salmon may also be temporarily influenced by periodic drilling discharges, and as a result the localized distribution on migrating salmon may also be affected. Such effects, if they occur at all, are expected to be short-term.

With the addition of the current and future 5-year program, a total of 29 oil spills (see Table IV.B.4-2) are estimated to occur over the next 35 years as a result of the following



activities: oil and gas activities in California, tanker activity in the Gulf of Alaska (i.e., TAPS oil production), and tanker activity (i.e., TAPS and foreign imports) offshore Washington, Oregon, and California. Eleven of these oil spills, (seven in southern California) are estimated to occur from platforms or pipelines as a result of OCS activities. The remainder of these oil spills are estimated to occur as a result of tanker activity (see Table IV.B.4-1). As discussed for existing oil and gas activities, the life-history stages of Pacific salmon that are most sensitive to oil exposure are expected to be outmigrating smolts, nearshore feeding juveniles, and adults that are preparing to ascend their home rivers to spawn. Thus, as previously discussed, salmon stocks originating in the Pacific Region are expected to be affected primarily by oil spills that occur in those areas where salmon producing rivers are located and these sensitive life-history stages occur in abundance. These areas include Washington, Oregon, and northern and central California. In contrast, oil spills that occur in the Gulf of Alaska and southern California are not expected to affect salmon stocks originating in Washington, Oregon, or northern and central California since the life-history stages of those stocks that are most sensitive to oil spills do not typically occur in these areas.

With the addition of the current and future 5-year programs, Pacific Region salmon populations are expected to be affected by eight oil spills occurring offshore Washington, Oregon, northern California, and central California over the next 35 years (see Table IV.B.4-2 for the distribution of oil spills within the planning areas). Only two oil spills, however, one each in northern and central California, are estimated to occur from the future and current 5-year program (i.e., platform spills). The remainder of these oil spills are estimated to occur as a result of TAPS or foreign import tanker activity. For the purposes of this analysis, it is assumed that these spills will occur with an even or uniform distribution among seasons and over the next 35 years, and that two of these oil spills will occur within 1 year in two different planning areas. Based on these assumptions, therefore, these expected oil spills are generally assumed to occur in different seasons approximately once every 12 years offshore Washington and/or Oregon, approximately once every 17-18 years offshore northern California, and approximately once every 9 years offshore central California, with two oil spills occurring in 1 year in two different areas (assumed to be Washington and central California).

Each of these oil spills is assumed to contact and affect sensitive life stages (i.e., smolts, juveniles, and/or prespawning adults) of salmon occurring in estuaries or in nearshore waters adjacent to productive salmon rivers, and are, therefore, expected to reduce salmon populations by causing direct mortality of outmigrating smolts, by reducing the survivorship of outmigrating smolts, or by reducing the spawning escapement of adult salmon through "straying" or delays in spawning runs. Prey organisms of juvenile salmon occurring in estuarine or nearshore habitats may also be impacted by an oil spill, and the growth and survival of juvenile salmon may be indirectly affected by a spill. Reductions in smolt/juvenile production or spawning escapement as a result of these factors could result in a future decline in the abundance of returning spawners for the stock or population affected. The magnitude of this decline is likely to be highly variable, but it is expected to be related to the degree of oil contamination that occurs, the duration of the contamination, the size of the coastal area and number of productive river systems affected, and the proportion of total smolt production and/or the spawning adult population that is contacted and affected by a spill.

The impacts to salmon from individual oil spills are generally expected to be localized unless a large number of productive rivers and streams, or a major river system (e.g., Columbia River) is affected. In the case where two oil spills in different areas occur in a single year (e.g., Washington and central California), and sensitive life-history stages are contacted, the impacts to salmon are expected to be greater since a larger area and more salmon populations are likely to be affected. Since salmon produced in any 1 year spend from 1 to 3 years (depending upon the species and/or stock) maturing before returning to spawn, their contribution to future

spawning runs will also be largely spread over a 1- to 5-year period. For this reason, the greatest decline in abundance of future spawning runs or populations resulting from the impacts of one or two oil spills in any given year is expected to be spread primarily over a period of from 1-5 years following the spill event. However, for those salmon stocks (e.g., chinook and chum) in which the spawning run is dominated by only a few, or one, year class (e.g., 3- and/or 4-year old fish), or where the run consists of essentially a single year class (e.g., pink salmon), the decline in abundance of future spawners may occur for periods in excess of 5 years and thus the impacts would be greater. In some cases, reductions in spawning runs may require 2-3 brood cycles, or from 4-12 years, to recover fully.

Both the magnitude and duration of oil spill impacts to salmon populations may be somewhat buffered in those cases where several year classes, and not just the year class affected by a prior oil spill, contribute significantly to future spawning runs. However, for those stocks where only a few, or one, year class dominate the spawning run, it is unlikely that other contributing year classes will substantially buffer oil spill impacts. Since individual oil spills in Washington, Oregon, northern California, and central California from oil and gas production and tanker activity are estimated to occur at intervals of approximately 9-17 years over the next 35 years, and the duration of impacts from individual oil spills is estimated to be 1-5 years, and possibly up to twice that long, the impacts of multiple, widely-spaced oil spills on Pacific Region salmon populations are not expected to be overlapping or cumulative.

**CONCLUSION:** The long-term cumulative impacts to some migratory salmon populations originating in the Pacific Region are expected to be moderate, primarily due to the combined impacts of overharvesting by commercial and sport fishermen, habitat loss, and oil spills resulting primarily from coastal tanker activity.

b. Walleye Pollock

The walleye pollock very likely comprises the largest commercially valuable biomass of the deepwater finfishes in North Pacific and eastern Bering Sea waters. While pollock occur in all North Pacific and Bering OCS planning areas, the largest populations are found in the Gulf of Alaska near Kodiak Island and in the Bering Sea along the continental shelf in the St. George, North Aleutian, and Navarin Planning Areas. The fish, while considered to be a deepwater species, exhibit considerable upward changes in depth which appears to be somewhat related to light. The eggs and early larvae are present at surficial to shallow depths.

Pollock are the most abundant demersal fish on the continental shelf of the Bering Sea. Their populations declined in the early 1970's because of overharvesting by foreign fisheries, but slowly increased to a standing stock biomass of approximately 7.5 million tons by 1979 (Thorsteinson, 1984). The Bering Sea stock is currently stable, although smaller than prior to its decline (DOI, MMS, 1985a). In the Gulf of Alaska, a large, dense group of prespawning and spawning pollock was discovered in the Shelikof Strait area in 1980 (DOI, MMS, 1984a). Since that date, they have been fished in the Shelikof Strait, and the total biomass of pollock has declined substantially. The reasons for this decline are not known, but overfishing and poor recruitment are both possibilities. In the past, it was believed that pollock from the entire central and western Gulf of Alaska migrated to the Shelikof Strait in the spring (North Pacific Fisheries Management Council, 1988). If so, then the population of pollock in the Gulf of Alaska could be at a very low level. It is also possible that the premise of extensive concentration in the Shelikof Strait from a much broader area is not valid. Associated with past, ongoing and projected non-OCS activities, and past and ongoing OCS activities, walleye pollock would be affected principally by the commercial trawl fisheries that harvest large amounts of these fish annually. Included is a roe fishery that sometimes discards all but this high-value portion of the fish. The State fisheries resources agency attempts to manage this species for a maximum sustainable yield.



Oil or fuel spills from exploratory drilling on active leases from past lease sales or from fishing vessels could have an impact on pollock, directly to their eggs and larvae or indirectly to their food supply. Direct toxic effects could occur particularly during the short time period when the eggs are near the surface. Pollock, however, have an extended spawning season and range of waters; hence, the probability of oil and gas operations contacting vulnerable eggs and pre-larvae to the point where a noticeable population impact could result is very low. Further, a relatively long overall spawning period for this fish, measured over some months, and the relative low density of its eggs, measured in units of tens per cubic meter of seawater versus thousands of eggs per female, would apparently preclude any significant adverse impact on the species.

Discharges from offshore drilling are largely to the benthic zone, and any toxic effect to the biota is usually limited to within a hundred meters from the discharge point. These discharges are also intermittent which further limits their impacts. The conclusion then is that drilling discharges would have very low impact on the bathypelagic walleye pollock, including eggs and larvae.

Impacts with the addition of the current and future 5-year programs could be expected to be qualitatively similar but quantitatively slightly higher than without it. Oil spills from platforms, pipelines, or tankering could be expected to produce the greatest impacts. A mean number of about 30 oil spills of 1,000 barrels or greater could be estimated to occur within the major range of the species over about a 40-year time period (see Table IV.B.4-2).

If walleye pollock eggs and early larvae inhabiting upper pelagic to surface waters were exposed to two oil spills originating from two different planning areas during a single spawning season, the adverse impact to the species would increase. However, given the species broad distribution in comparison with the relatively limited areal extent of all save the largest oil spills, the spill-related population loss above the natural mortality would very likely not be discernible.

**CONCLUSION:** Cumulative activities are expected to have a very low impact on walleye pollock populations.

#### **c. Steelhead Trout**

The abundance of steelhead in California has declined dramatically since the 1950's due to increased sport fishing pressure, and damage to freshwater and estuarine fish habitat as a result of dam construction, water diversion, other types of construction, and generally improper land management practices (Barnhart, 1986). In California, attempts are being made to maintain existing natural stocks of steelhead and their spawning and rearing habitat, to restore or enhance presently degraded habitat, and to supplement natural production with hatchery produced steelhead (CDFG, 1975, as cited in Barnhart, 1986). However, in some rivers steelhead production and a fishery would be nonexistent without hatchery produced stocks.

A similar situation exists in Oregon and Washington where steelhead abundance has declined from excessive sportfishing pressure and habitat loss and/or degradation (Pauley et al., 1986). In particular, the presence of dams and reservoirs, which cause loss of natural habitat and increased mortality of outmigrating smolts, has contributed greatly to the serious reduction of steelhead produced from Columbia River stocks (Pauley et al., 1986). Other factors contributing to the decline of steelhead include poor logging, road building and irrigation practices, and overgrazing by livestock. As in California, natural steelhead runs are heavily supplemented by hatchery stocking in Oregon and Washington.

Over the next 35 years, the principal non oil-related factors or activities that may impact migratory steelhead stocks include natural fluctuations in environmental conditions, sport and tribal Indian fishing activities, and the loss and/or degradation of freshwater spawning and

nursery habitat as a result of various onshore activities such as hydroelectric power projects, water diversions for agriculture and development, and timber and construction activities.

Sport and tribal Indian fishing for steelhead produced from rivers in California, Oregon, and Washington are expected to continue over the next 35 years, primarily in the freshwater streams and rivers supporting individual stocks. Additional fishing effort for steelhead is expected to occur in marine waters offshore California, Oregon, and Washington, and possibly offshore southeast Alaska and in the Gulf of Alaska as a result of foreign intercepts. Although the relative contributions to total fishing mortality of steelhead from these various sources of fishing pressure are not clear, the most intense fishing pressure on steelhead stocks is expected to occur in the freshwater streams and rivers supporting steelhead production.

Regulation of this freshwater and nearshore fishing effort on steelhead stocks is expected to continue over the next 35 years under the jurisdiction of the States of California, Oregon, and Washington. Historical catch data for steelhead produced in Washington, and presumably Oregon and California, indicate that the annual sport and tribal Indian catch (i.e., fishing mortality) can vary substantially (Pauley et al., 1986). The magnitude of future steelhead harvests by sport and tribal Indian fisheries in the freshwater streams and rivers of California, Oregon, and Washington is expected to be highly variable from year to year, but is likely to generally fall within the range of harvests observed since the mid- to late-1970's.

The impact of existing and future sport, tribal Indian, and other types of fishing pressure on steelhead populations originating in California, Oregon, and Washington is difficult to estimate, but it is expected to be similar to that discussed for Pacific salmon. In large part, the impact of sport and tribal Indian fishing pressure on the abundance of steelhead stocks will be based on the accuracy of pre-season stock abundance estimates made by the respective anadromous fish resource management agencies in Washington, Oregon, and California, and on the effectiveness of their management measures designed to control fishing pressure and harvest levels so that spawning escapement goals can be achieved and stock sizes maintained or increased. If pre-season abundance estimates are inaccurate and excessive fishing pressure is allowed on one or more stocks, then insufficient spawning escapement may occur that could result in a reduced level of spawning and smolt production. This reduction in smolt production could result in a future decline in the abundance of the returning spawners. The magnitude of this decline is expected to be highly variable, but it is generally expected to be related to the magnitude of overfishing and the associated reduction in escapement, and possibly other unrelated factors. Since steelhead produced in any 1 year generally spend from 2-4 years (depending upon the stock) maturing before returning to spawn, their contribution to future spawning runs will also be largely spread over a 2- to 4-year period.

For this reason, the decline in abundance of future spawning runs or populations resulting from overfishing and insufficient spawning escapement in any given year is expected to be spread primarily over a period of 2-4 years. However, the actual magnitude and duration of impacts on steelhead abundance from overfishing and reduced spawning escapement are expected to be somewhat buffered, since individual spawning runs or populations in any given year are typically comprised of fish produced over several preceding years (i.e., several year classes), not just the year class impacted by overfishing.

Although a major goal of State agencies responsible for anadromous fish resource management is to avoid overfishing and achieve spawning escapement goals, it is very likely that some degree of overfishing will occur several times over the next 35 years because of the difficulty in accurately assessing the abundance of spawning runs, and then allocating the available fish among competing sport and tribal Indian fisheries and escapement. Reductions in the abundance of specific steelhead stocks are expected to result from overfishing; however, the impacts are expected to generally last 2-4 years at most because of ongoing fishery management



efforts by State resource agencies. Significant reductions have occurred historically in the spawning and rearing habitat available to salmon and steelhead populations originating throughout California, Oregon, and Washington. As a result of these habitat losses, significant long-term reductions in steelhead populations have occurred throughout the Region over the last 20-50 years. Some of the effects of these habitat losses on anadromous fishes are discussed under Pacific Salmon (See Section IV.D.3.a(2)). The prospects for increased habitat availability and/or improvement through restorative or rehabilitative efforts are also discussed under Pacific Salmon (See Section IV.D.3.a(2)). Thus, as for Pacific salmon, the long-term trend in habitat availability or improvement for Pacific Region steelhead over the next 35 years is expected to vary between stocks, depending in large part on whether rehabilitation or restoration efforts are conducted to improve habitat availability and reduce other existing impacts on the stock. As with Pacific salmon, however, those stocks that continue to be impacted by existing activities over the next 35 years, and are not rebuilt or enhanced through restoration or rehabilitation efforts, may be particularly susceptible to cumulative impacts from other non-oil or oil-related activities.

The principal impacting agents that could potentially impact migratory steelhead stocks over the next 35 years as a result of existing and approved oil/gas activities are discussed under Pacific Salmon (see Section IV.D.3.a(2)). These include seismic survey activities, the discharge of drill muds and cuttings, and accidental oil spills.

The seasonal abundance of migratory steelhead in southern California is relatively low compared to other areas in the Pacific Region; however, some steelhead may occur in those areas where seismic survey activities will occur over the next 35 years. Migratory steelhead are expected to be widely dispersed while in southern California; thus, only some of the fish transiting the area are likely to be within the influence of, or affected by, acoustic discharges. Based on existing information, acoustic discharges from existing and future seismic survey activity may cause localized and temporary (minutes to hours) changes in the distribution of steelhead migrating through the Santa Maria Basin and Santa Barbara Channel; however, such activities are not expected to cause any discernible lethal impacts that would reduce the abundance of steelhead populations. As discussed for salmon, the available information suggests that steelhead prey organisms are not likely to be adversely impacted by airgun discharges from seismic survey activities. If the local distribution or abundance of steelhead prey organisms were affected by airgun discharges, it is possible that the localized distribution of steelhead might be indirectly affected as well. Drilling discharges expected to occur in southern California from exploratory, delineation, and production wells over the next 35 years are discussed under Pacific Salmon in Section IV.D.3.a(2). The abundance of migratory steelhead in southern California is very low compared to other areas further north in the Pacific Region; however, some steelhead can be expected to occur seasonally in those areas (i.e., the Santa Maria Basin and Santa Barbara Channel) where drill muds and cuttings will be discharged over the next 35 years. Migrating steelhead are expected to be widely dispersed while in southern California; thus only some of the fish transiting the area are likely to come into contact with these materials since they will be discharged intermittently and are expected to be diluted rapidly.

Any exposure of steelhead to these discharges is expected to be limited in duration since these discharges occur only intermittently, influence only a relatively small area, and remain in the water column for only a short period of time. Temporary exposure of migrating steelhead to these drilling discharges may result in localized and short-term (minutes to hours) changes in distribution if fish avoid the discharge plume; however, such discharges are not expected to cause any discernible lethal impacts that would result in a decline in the abundance of steelhead populations. It is possible that prey organisms of migrating steelhead may also be temporarily affected by exposure to periodic drilling discharges, and as a result the localized distribution of

migratory steelhead may also be affected. Changes in the local distribution or abundance of steelhead as a result of effects on prey are expected to be short-term and generally comparable to those that would be expected if fish simply avoided the discharge plume.

Over the next 35 years, a total of 21 oil spills are estimated to occur from the Gulf of Alaska to southern California as a result of the following activities: oil and gas activities in southern California, tanker activity in the Gulf of Alaska (i.e., TAPS oil production), and offshore Washington, Oregon, central California, and southern California (See discussion under Pacific Salmon in Section IV.D.3.a(2)).

The life-history stages of steelhead that are expected to be most sensitive and vulnerable to oil exposure are the same as those discussed for Pacific salmon (see Section IV.D.3.a(2)). In addition to direct effects on these steelhead life-history stages, the growth and eventual survival of outmigrating smolts and juveniles occurring in estuarine and nearshore waters may be adversely impacted if their prey organisms are affected by exposure to oil and are reduced in abundance. For these reasons, steelhead stocks originating in the Pacific Region are primarily expected to be affected by oil spills that occur in those areas where steelhead producing rivers are located. These areas include Washington, Oregon, and northern and southern California. In contrast, oil spills that occur in the Gulf of Alaska or southern California are not expected to reduce steelhead stocks originating in Washington, Oregon, or California since the life-history stages of these stocks that are most sensitive to oil spills typically do not occur in these areas.

As discussed for Pacific salmon (see Section IV.D.3.a(2)), over the next 35 years steelhead stocks in the Pacific Region are expected to be affected by six oil spills from existing activities that occur offshore Washington, Oregon, and central California. Assumptions regarding the frequency of these oil spills are discussed for Pacific salmon in the analysis of existing and approved activities. These oil spills are assumed to contact and affect sensitive life-history stages (i.e., smolts, juveniles and/or prespawning adults) of steelhead occurring in nearshore waters near productive steelhead rivers since these life stages are expected to occur throughout much of the year in many areas.

As discussed for Pacific salmon (see Section IV.D.3.a(2)), these oil spills are expected to reduce steelhead populations by causing direct mortality of outmigrating smolts or juveniles, by reducing the survivorship of outmigrating smolts or juveniles, by reducing the abundance or availability of prey utilized by smolts or juveniles, or by reducing the spawning escapement of adult steelhead through "straying" or delays in spawning runs. Reductions in smolt/juvenile production or spawning escapement from these types of impacts could result in a future decline in the abundance of returning spawners. The magnitude of this decline is expected to be highly variable, but is expected to be related to the degree of oil contamination that occurs, the duration of the contamination, the coastal area and number of productive river systems affected, and the proportion of total smolt/juvenile production and/or the spawning adult population that is affected.

The impacts to steelhead from individual oil spills are generally expected to be localized unless a large number of productive rivers and streams, or a major river system (e.g., Eel or Klamath Rivers) is affected. In the hypothetical case where two oil spills occur in a single year (e.g., Washington and central California) and sensitive life-history stages are affected, the overall impacts to steelhead are expected to be greater since a larger area and more steelhead stocks will likely be affected. Since steelhead produced in any 1 year generally spend from 2-4 years (depending upon the stock) maturing before returning to spawn, their contribution to future spawning runs will also be largely spread over a 2- to 4-year period. For this reason, the greatest decline in abundance of future spawning runs or populations from the impacts of one or even two oil spills in different areas is expected to be spread primarily over a period of 2-4 years following the oil spill event.



Both the magnitude and duration of oil spill impacts to steelhead populations may be somewhat buffered in those cases where several year classes, and not just the year class affected by a prior oil spill, contribute significantly to future spawning runs. However, for those stocks where only a few, or possibly one, year class dominates the spawning run, it is unlikely that other contributing year classes will completely buffer oil spill impacts. Since individual oil spills occurring offshore from Washington, Oregon, and central California from tanker activity are estimated to occur at intervals of approximately 10-12 years (based on the assumption of an even or uniform spill distribution) over the next 35 years, and the duration of impact from an individual oil spill is estimated to be 2-4 years, and possibly up to twice that long, the impacts of multiple, widely-spaced oil spills on steelhead populations are not expected to be overlapping or cumulative. However, if the expected tanker oil spills actually occur at more frequent intervals than assumed in the analysis above, and the duration of impacts from a single spill is greater than 4 years, then the duration of oil spill impacts could be greater, possibly ranging up to 6-9 years or greater.

The principal non oil-related factors or activities that may affect migratory steelhead stocks with the addition of the current and future 5-year programs over the next 35 years are the same as those previously discussed above. These include natural fluctuations in environmental conditions, sport and Indian fish activities, and the loss or degradation of spawning or nursery habitat.

Long-term cumulative impacts may occur to migratory steelhead stocks originating in the Pacific Region as a result of both existing, approved, and future OCS activities, as well as existing and future non-OCS oil-related activities. The principal agents that could potentially affect migratory Pacific Region steelhead stocks over the next 35 years as a result of existing, approved, and future oil/gas activities include: seismic survey activities and drilling discharges (from exploration and development) from oil- and gas-related activities throughout the Pacific Region, oil spills resulting from development activities (platforms and pipelines), and oil spills from tanker (i.e., TAPS and foreign imports) activity throughout the Pacific Region and the Gulf of Alaska.

Seismic survey activities in the Pacific Region and the Gulf of Alaska with the addition of the current and future 5-year programs are discussed under Pacific Salmon (see Section IV.D.3.a.(2)). Migrating steelhead originating from rivers located primarily in Washington, Oregon, and northern and central California are expected to occur in offshore areas in the vicinity of seismic surveys operations throughout the Pacific Region and the Gulf of Alaska over the next 35 years. As discussed for the hypothetical case for existing and approved activities alone, however, available studies indicate that acoustic signals produced by airguns and other devices used in seismic surveys are expected to harm few, if any, fish directly (unless they are in extremely close proximity to the source), have no or little adverse effect on steelhead prey organisms, and thereby cause little more than localized and temporary changes in the distribution of some migratory steelhead. As a result, therefore, oil and gas seismic surveys throughout the Pacific Region and the Gulf of Alaska over the next 35 years may cause localized and temporary (hours to days) changes in the distribution of some migrating steelhead, but are not expected to cause any discernible lethal impacts that would reduce the abundance of steelhead populations.

An increase in drilling discharges (i.e., drill muds and cuttings) are expected to occur in the Gulf of Alaska and throughout the Pacific Region from exploratory, delineation, and production wells drilled over the next 35 years with the addition of the current and future 5-year programs (see discussion under Pacific Salmon IV.D.3.a.(2)), with the vast majority occurring in southern California. Although migratory steelhead are expected to pass through areas where drill muds and cuttings are discharged over the next 35 years, not all fish transiting

through areas with drilling activity and discharges are likely to come into contact with these materials since fish are expected to be relatively dispersed, discharges are expected to occur intermittently, and discharges are expected to be diluted rapidly and influence only small areas.

Exposure to these discharges, if it occurs at all, is also expected to occur for only short periods of time as discussed previously. As discussed above, the available literature indicates that these types of drilling discharges generally result in no short-term or acutely lethal impact to marine organisms, including fish. It is possible, however, that temporary exposure of migratory steelhead to these drilling discharges may result in localized and short-term (minutes to hours) changes in distribution if some fish avoid the discharge plume. It is also possible that prey organisms utilized by migrating steelhead may also be affected by discharges, and that as a result the local distribution of steelhead may also be affected. Even if localized and short-term changes in steelhead distribution and abundance occur, however, these discharges are not expected to cause any discernible lethal impacts that would reduce the abundance of steelhead populations.

With the addition of the current and future 5-year programs a total of 29 oil spills are estimated to occur over the next 35 years as a result of the following activities: oil and gas activities in California, tanker activity (i.e., TAPS and foreign imports) in the Gulf of Alaska and offshore Washington, Oregon, and California (see discussion under Pacific Salmon IV.D.3.a(2)). Eleven of these oil spills, primarily occurring in southern California (with a total of seven oil spills), are estimated to occur from platforms or pipelines as a result of OCS activities. The remainder of these oil spills are estimated to occur as a result of tanker activity. As discussed for existing and approved oil and gas activities, the life-history stages of steelhead that are most sensitive to oil exposure are expected to be outmigrating smolts, nearshore feeding juveniles, and adults that are preparing to ascend their home rivers to spawn. Thus, as in the hypothetical case analyzed above, steelhead stocks originating in the Pacific Region are expected to be affected primarily by oil spills that occur in those areas where steelhead producing rivers are located and sensitive life history stages occur in abundance. These areas include Washington, Oregon, and northern and central California. In contrast, oil spills that occur in the Gulf of Alaska and southern California are not expected to affect steelhead stocks originating in these other areas since the sensitive life-history stages of these stocks typically do not occur in these areas.

Therefore, with the addition of the current and future 5-year programs, steelhead populations are only estimated to be affected by the eight oil spills occurring offshore Washington, Oregon, northern California, and central California over the next 35 years (see Table IV.B.4-2). Only two spills, however, (one each in northern and central California) are estimated to occur from OCS platforms. The remainder of these oil spills are expected to occur as a result of TAPS or foreign import tanker activity. The assumptions regarding oil spill frequency by planning area for these spills are the same as those described in the analysis of Pacific Salmon for the case involving the addition of the current and future 5-year programs.

For the purposes of this analysis, these eight estimated oil spills are assumed to contact and affect sensitive life stages (i.e., smolts, juveniles, and/or prespawning adults) of steelhead occurring in estuaries or in nearshore waters adjacent to productive steelhead rivers, and are, therefore, expected to impact steelhead populations by causing direct mortality of outmigrating smolts, by reducing the survivorship of outmigrating smolts, or by reducing the spawning escapement of adults through "straying" or delays in spawning runs. Prey organisms of juvenile steelhead may also be impacted by these spills, thereby indirectly affecting the growth and survivorship of some fish. Reductions in smolt production or spawning escapement as a result of these impacts could result in a future decline in the abundance of returning spawners for the stock or population affected. The magnitude of this decline is likely to be highly variable, but it



is expected to be related to the degree of oil contamination that occurs, the duration of the contamination, the coastal area and number of productive river systems affected, and the proportion of the total smolt production and/or the spawning adult population that is affected.

The impacts to steelhead from individual oil spills are generally expected to be localized unless a large number of productive rivers and streams, or a major river system (e.g., Eel or Klamath River) is affected. In the case where two oil spills in different areas occur in a single year (e.g., Washington and central California), and sensitive life-history stages are contacted, the impacts to steelhead are expected to be greater since a larger area and more steelhead stocks are likely to be affected. Because steelhead produced in any one year spend from 2-4 years (depending upon the stock) maturing before returning to spawn, their contribution to future spawning runs will also be primarily spread over a 2-4 year period. For this reason, the greatest decline in abundance of future spawning runs or populations from the impacts of one or two oil spills in any given year is generally expected to be spread primarily over a period of from 2-4 years following the oil spill event. However, for those steelhead stocks in which the spawning run is dominated by only a few, or one, year class, the decline in abundance of future spawners may occur for periods in excess of 4 years, and thus the impacts would be greater.

Both the magnitude and duration of oil spill impacts to steelhead populations may be somewhat buffered in those cases where several year classes, and not just the year class affected by a prior oil spill, contribute significantly to future spawning runs. However, for those stocks where only a few, or one, year class dominate the spawning run, it is unlikely that other contributing year classes will substantially buffer oil spill impacts. Since individual oil spills are estimated to occur in Washington, Oregon, northern California and central California from oil and gas production and tanker activity at intervals of approximately once every 9-17 years over the next 35 years, and the duration of impacts from individual spills are estimated to occur primarily for a period of 2-4 years, and possibly up to twice that long, the impacts of multiple spills on steelhead populations in the Pacific Region are not expected to be overlapping or cumulative.

**CONCLUSION:** The long-term cumulative impacts to some migratory steelhead populations originating in the Pacific Region are expected to be moderate, primarily due to the combined impacts of overharvesting by commercial and sport fishermen, habitat loss, and oil spills resulting primarily from coastal tanker activity.

#### d. Pacific Whiting

Analysis of fishery catch data from 1985-86 and 1986 research fishing survey data from the California Department of Fish and Game suggest the whiting subpopulation and fishery is presently dominated by young fish from the 1984 and 1986 year classes. The 1984 year class was evidently very large, and represented nearly 60 percent of the estimated population abundance and 37 percent of the estimated population biomass in 1987 (PFMC, 1987). The strength of these year classes suggests that at least over the next several years, the whiting subpopulation centered off California, Oregon, and Washington will be at a relatively high level of abundance.

The principal non oil-related factors or activities expected to affect the whiting subpopulation over the next 35 years are natural fluctuations in abundance resulting from fluctuating environmental conditions and variable year class strength, and juvenile and adult mortality resulting from directed domestic and foreign commercial fishing pressure on the subpopulation.

According to MBC (1986) fish scale deposits in the southern California Bight suggest that the Pacific whiting subpopulation located offshore California has undergone considerable natural fluctuations in abundance over the past two hundred years. In the early 1900's, for example, the whiting population was evidently an order of magnitude larger than at present based on this fish scale data. The Pacific whiting is a long-lived species (up to 17 years, but typically

8-12 years), with several year classes contributing to the adult population and the commercial fishery at any given time. However, year class strength of whiting is highly variable and strong year classes with successful recruitment have been directly correlated to the presence of favorable environmental conditions at the time of spawning and early larval development (PFMC, 1987).

For example, research fishing surveys conducted by the California Department of Game over the past 20 years indicate that strong year classes of whiting were produced in 1967, 1970, 1973, 1977, 1980, 1984, and 1986 (PFMC, 1987). In contrast, the same data indicate that weak year classes occurred in 1981 and 1983. Historical fishery catch data suggest that these dominant year classes of whiting are the major determinants of population abundance and support the commercial fishery. As discussed above, the strong year classes of 1984 and 1986 are currently dominating the whiting subpopulation and commercial fishery. Since several year classes (up to 10 or more) contribute to the adult whiting subpopulation occurring offshore California, Oregon, and Washington, weak year classes could potentially reduce whiting subpopulation abundance for several years (up to 10 or more).

The impacts of weak year classes on the whiting subpopulation abundance, however, are expected to be buffered by the large number of year classes that contribute to the adult subpopulation, as well as the periodic strong year classes that have tended to dominate the subpopulation in the last 20 years. Assuming that strong year classes continue to occur every 3-4 years over the next 35 years as they have in the past 20 years, then the impacts on whiting subpopulation abundance from occasional weak year classes are unlikely to persist for longer than 3-4 years.

Domestic and foreign commercial fishing pressure is expected to continue on the Pacific whiting subpopulation offshore California, Oregon, and Washington over the next 35 years. However, the impact of this commercial fishing pressure on whiting subpopulation abundance is difficult to estimate. As discussed in Section IV.C., the annual commercial catch of whiting has averaged approximately 125,000 mt over the last 20 years, but has generally been decreasing since 1980. The subpopulation is considered healthy at present, and if strong year classes are assumed to occur periodically (i.e., ever 3-4 years), then it is likely that annual catches of whiting over the next 35 years will generally fall within the range observed in the past 20 years.

As discussed above, the commercial fishery for whiting and the magnitude of the commercial harvest is strongly influenced by the presence of strong year classes in the harvestable population. Since strong year classes largely support the commercial fishery, commercial fishing pressure that overharvested one or more strong year classes that dominated the subpopulation could potentially reduce the abundance of the adult whiting subpopulation off California, Oregon, and Washington. However, since strong year classes are expected every 3-4 years based on past records, it is expected that recovery of the subpopulation would occur within a period of 3-4 years.

Long-term cumulative impacts could potentially occur to the Pacific whiting subpopulation occurring offshore California, Oregon, and Washington as a result of both existing and approved OCS and non-OCS oil-related activities. The principal agents (seismic survey activities, drilling discharges, and oil spills) that could potentially affect the whiting subpopulation over the next 35 years as a result of existing and approved oil/gas activities are discussed under Pacific Salmon (see Section IV.D.3.a.(2)). These include seismic surveys, drilling discharges, and accidental oil spills.

As discussed for Pacific salmon, currently available information suggests that seismic surveys may cause very localized and short-term changes in the distribution and/or abundance of fish



that last on the order of several hours to several days at most, but are unlikely to cause direct mortality of fish. Recent controlled field studies concerning the impacts of airgun discharges on the eggs and larvae of fish and shellfish indicate that direct mortality is relatively small or nonexistent, and if mortality does occur it is only when these stages are in very close proximity (i.e., 1-3 m) to the airgun source (Tracor Applied Sciences, 1987; Dalen and Knutsen, 1986; Battelle and BBN, 1989). These recent studies also suggest that prey organisms of Pacific whiting are unlikely to suffer direct mortality from airgun discharges; however, it is possible that their localized distribution or abundance may be affected.

The egg, larval, juvenile, and adult life-history stages of whiting are expected to occur throughout much of the year in those portions of southern California where seismic survey activities will occur over the next 35 years. Although some whiting life-history stages are expected to occur in the vicinity of where these surveys will be conducted, these stages are generally most abundant at depths of 50-100 m, and are widely dispersed throughout the southern California area. Based on the broad depth and geographic distribution of whiting life-history stages throughout southern California, as well as the available information concerning the effects of airgun discharges on various life history stages of fish, seismic survey activity from existing and/or approved activities may cause localized and temporary (hours to days) changes in the distribution of juvenile or adult whiting occurring in the Santa Maria Basin and Santa Barbara Channel, but are not expected to result in any discernible lethal impacts to adults or the early life-history stages (i.e., eggs and larvae) that would reduce the abundance of the whiting subpopulation off California, Oregon, and Washington.

Drilling discharges (i.e., drill muds and cuttings) are expected to occur in southern California from exploratory, delineation, and production wells over the next 35 years as discussed for Pacific salmon in Section IV.D.3.a(2). Neff (1985) reviewed substantial literature that indicated drilling muds or fluids are rapidly diluted within several meters of a discharge location and that these discharges generally result in no short-term or acutely lethal impact to marine organisms. The egg, larval, juvenile, and adult life-history stages of whiting, and their prey organisms, are expected to occur throughout much of the year in those portions of southern California where drill muds and cuttings will be periodically discharged over the next 35 years.

Although some whiting life-history stages may occur in the general vicinity of where these discharges will occur, these organisms are widely dispersed throughout the southern California area and are generally most abundant at depths of 50-100 m. Based on the broad depth and geographic distribution of all whiting life-history stages throughout southern California, and the fact that these discharges are expected to occur intermittently and be rapidly diluted in close proximity to all drilling sites, only a relatively small proportion of the egg, larval, juvenile or adult stages occurring in southern California are expected to come into contact with drilling discharges.

Any exposure of whiting life-history stages to these discharges is expected to be limited in duration since the discharges will occur only intermittently, influence only a relatively small area around the drilling sites, and remain in the water column for only a short period of time. Temporary exposure of whiting life-history stages to these drilling discharges may result in localized and short-term (minutes to hours) changes in the distribution of juveniles or adults if fish avoid the discharge plume, or if their prey are affected by the discharge and change their distribution and/or abundance. Overall, however, such discharges are not expected to result in any discernible lethal impacts on the early life-history stages of whiting that would result in a decline in the abundance of the whiting subpopulation occurring off California, Oregon, and Washington.

A total of 21 oil spills are estimated to occur between the Gulf of Alaska and southern California over the next 35 years from the following activities: existing and/or approved oil and

gas activities in southern California, tanker activity in the Gulf of Alaska (i.e., transportation of TAPS oil production), and tanker activity offshore Washington, Oregon, central California, and southern California (see discussion under Pacific Salmon in Section IV.D.3.a(2)). Of the total number of spills estimated to occur over the next 35 years, a total of eight are expected to occur in southern California. Of these, only three are expected to occur from OCS related activities. The remaining five spills are expected to occur as a result of non-OCS related tanker activity.

The egg and larval stages of whiting, rather than the juveniles or adults, are potentially most sensitive and vulnerable to oil spills. Based on the existing literature (MBC and SAI, 1983, and others), these early life-history stages could potentially suffer direct mortality, as well as sublethal impacts on feeding and growth, as a result of oil exposure. It is also possible that the prey organisms of these early life-history stages, as well as those utilized by juveniles and adults could be impacted by an oil spill. Since whiting spawn primarily in southern California, and to a lesser extent in central California, only the eight spills expected to occur in southern California could potentially impact these early life-history stages.

If a substantial proportion of the total whiting egg and larval production in southern California were to suffer mortality or reduced survivorship due to an oil spill, then it is possible that eventual recruitment of juveniles or adults could also be reduced. As noted above, these early life-history stages are abundant and occur throughout southern California, and to a lesser extent in central California, in the fall and winter when whiting spawn. Since the eggs and larvae of whiting are widely distributed throughout southern California, occur primarily offshore rather than in nearshore waters, and are most abundant at depths well below the water surface (most abundant at depths of approximately 50 m), it is highly unlikely that an oil spill in southern California would contact and impact a substantial portion of these sensitive life stages. Pelagic juvenile and adult whiting also occur throughout southern California and much of the Pacific Region; however, neither a substantial portion of the subpopulation or its prey is likely to come into contact with an oil spill since they normally occur at depths well below the water surface (i.e., 90-100 m in daytime to 20-40 m at night) and are widely dispersed offshore. For these reasons, oil spills occurring in southern California, or elsewhere, are not expected to cause measurable reductions in the abundance of the whiting subpopulation off California, Oregon, and Washington.

Long-term cumulative impacts may occur to the Pacific whiting subpopulation occurring offshore California, Oregon, and Washington as a result of the addition of the current and future 5-year programs to existing and future non-oil related factors or activities. The principal non-oil related factors or activities expected to affect the whiting subpopulation over the next 35 years are the same as those discussed above for existing and approved activities alone. Similarly, the impacts of these factors or activities on the whiting subpopulation with the addition of the current and future 5-year programs are expected to be the same as those discussed above for existing and approved activities alone.

Long-term cumulative impacts could potentially occur to the Pacific whiting subpopulation occurring offshore California, Oregon, and Washington as a result of both existing, approved, and future OCS and non-OCS oil-related activities. The principal agents that could potentially affect the whiting subpopulation over the next 35 years as a result of existing, approved and future oil/gas activities include seismic survey activities and drilling discharges (from exploration and development) from OCS-related activities throughout the Pacific Region, platform and pipeline oil spills from OCS development activities in California, and oil spills from tanker (i.e., TAPS and foreign imports) activity throughout the Pacific Region and the Gulf of Alaska.

Seismic survey activities in the Pacific Region and the Gulf of Alaska as the result of the addition of the current and future 5-year programs are discussed under Pacific Salmon (see Section IV.D.3.a(2)). The egg, larval, juvenile, and adult life-history stages of whiting are



expected to occur throughout much of the year in those areas where seismic survey activities will occur over the next 35 years. Although whiting life-history stages are expected to occur in the general area where these surveys will be conducted, these stages are widely dispersed throughout the Region and are generally most abundant at depths of 50-100 m. As discussed above for existing and approved activities alone, exposure to airgun discharges is expected to cause little or no mortality of juvenile or adult fish, but may result in localized and temporary changes in the distribution of fishes. In addition, recent studies indicate that airgun discharges cause little or no direct mortality to the egg or larval stages of fish and shellfish even when these life stages are in very close proximity (i.e., 1-3 m) to an airgun source. The limited sensitivity of fish and shellfish eggs and larvae suggest that prey organisms of whiting life-history stages are unlikely to be adversely affected by airgun discharges.

Based on the broad depth and geographic distribution of whiting life-history stages throughout the Region and the available information concerning the impacts of acoustic discharges on these stages, seismic survey activity associated with the current and future 5-year programs is expected to cause little more than localized and temporary (hours to days) changes in the distribution of juvenile or adult whiting occurring in the vicinity of some survey. These changes may occur either as a result of avoidance of the source, or as a result of changes in prey distribution. Regardless of these changes in distribution; however, seismic surveys are not expected to result in any discernible lethal impacts to adult or early life-history stages (i.e., eggs and larvae) that would reduce the abundance of the whiting subpopulation off California, Oregon, and Washington.

Over the next 35 years, increases in drilling discharges (i.e., drill muds and cuttings) are expected to occur in the Gulf of Alaska and throughout the Pacific Region from exploratory, delineation, and production wells with the addition of the current and future 5-year programs. However, the vast majority of these wells are expected to be drilled in the southern California area. Based on the broad depth and geographic distribution of whiting life-history stages and their prey organisms offshore California and the Pacific Region, only a small portion of all whiting life-history stages in southern California are expected to come into contact with drilling discharges. If these life-history stages or their prey organisms are exposed to drilling discharges, it is only expected to be for short periods of time since discharges will occur intermittently, influence only a small area, and be diluted rapidly. As discussed above, the available literature indicates that these types of drilling discharges generally result in no short-term or acutely lethal impact to marine organisms. Temporary exposure to drilling discharges, however, may result in localized and short-term (minutes to hours) changes in the distribution of juveniles or adults if they avoid the discharge plume, or if the prey are affected by the discharge and change their distribution and/or abundance. Since no mortality and only localized and temporary changes in distribution are expected as a result of exposure to drilling discharges, these discharges are not expected to cause any discernible lethal impacts that would result in a decline in the abundance of the whiting subpopulation occurring off California, Oregon, and Washington.

With the addition of the current and future 5-year programs, a total of 29 oil spills are estimated to occur over the next 35 years as a result of the following activities: OCS oil and gas activities in California, tanker activity in the Gulf of Alaska (i.e., transportation of TAPS oil production), and tanker activity (i.e., TAPS and foreign imports) offshore Washington, Oregon, central California, and southern California. As discussed for Pacific salmon, the majority (18 of 29) of these estimated spills are expected to occur from tanker accidents. A total of 12 spills (7 from OCS platform/pipeline facilities) are estimated to occur in southern California.

As discussed above for existing oil and gas activities, the egg and larval stages of whiting, rather than juveniles or adults, are expected to be most sensitive and potentially vulnerable to oil spills. Based on the existing literature (MBC and SAI, 1983), these stages could potentially suffer direct mortality, as well as sublethal impacts on feeding and growth, as a result of oil exposure. It is possible also that the prey organisms of these stages, as well as juveniles or adults could be affected by an oil spill. Since whiting spawn primarily in southern California and their eggs and larvae are most abundant there as well, only the 12 spills estimated to occur in this area could potentially affect these stages or impact the whiting subpopulation.

If a substantial portion of the total whiting egg and larval production in southern California were to suffer mortality or reduced survivorship due to an oil spill, then it is possible that eventual recruitment of juveniles or adults could also be reduced. As noted above, these early life-history stages are most abundant and occur throughout southern California when whiting spawn in the fall and winter. Since the eggs and larvae of whiting are widely distributed throughout southern California, and occur primarily offshore at depths well below the water surface (i.e., most abundant at depths of approximately 50 m), it is unlikely that an oil spill in this area would contact and impact a substantial portion of these sensitive life history stages. Pelagic juvenile and adult whiting also occur in offshore waters throughout much of the Pacific Region; however, neither a substantial portion of the subpopulation or its prey is expected to come into contact with an oil spill because of their geographic and depth distribution. For these reasons, oil spills occurring offshore California, Oregon, or Washington are not expected to affect the whiting subpopulation occurring in this region.

**CONCLUSION:** The long-term cumulative impacts to the Pacific whiting subpopulation centered offshore California, Oregon, and Washington are expected to be moderate primarily due to the combined effects of commercial overfishing and natural fluctuations in subpopulation abundance due to fluctuating year class strength.

## **E. Alternatives to Simultaneous Development**

### **1. Introduction**

The court's ~~remand~~ was to provide for "further consideration" of the cumulative impacts on migratory species and for the Secretary to make "any revisions in the 5-year program that consideration may warrant." The court suggested the Secretary examine alternatives to simultaneous development that would mitigate any cumulative impacts on migratory species. The analysis in Section IV.D. of this document distinguishes impacts to migratory species from past, ongoing and future non-OCS and past and ongoing OCS activities from the impacts associated with the current and future 5-year programs. Because of this distinction, the analysis presented in Section IV.D. also serves as the analytical basis for Alternatives II, III and IV. The analysis considers whether deferral of one or more planning areas from future leasing or the phasing of OCS development would reduce the cumulative impact by one level or more. This section provides a summary of the analysis in IV.D as it relates to Alternatives II, III, and IV.

### **2. Alternative II - Defer leasing in One or More Planning Areas**

This alternative would defer leasing in the St. George Basin and/or Navarin Basin Planning Areas in the Alaska Region. The purpose for this deferral is to avoid the simultaneous oil and gas development activities that were identified in Section IV.D. as causing impacts on one or more migratory species. It is assumed for this analysis that any planning area deferred under this alternative would also be deferred from leasing under future 5-year programs. The cumulative impacts on most of the migratory species analyzed are expected to be like those described for Alternative I because the level of OCS activity and the potential risks of oil spills



that are important in projecting the level of cumulative impacts on most migratory species are not substantively reduced as compared to Alternative I. The impacts from non-OCS activities would be the same as those described for Alternative I because the activities are the same for both alternatives.

a. Marine Mammals

(1) Cetaceans

The level of OCS exploration, development, and production activities and the potential risks of oil spills that are important in projecting the level of cumulative impacts on cetaceans are not substantively reduced under this alternative as compared with the proposal. Noise associated with OCS and non-OCS activity in offshore areas is expected to result in temporary and non-lethal disturbances in animal behavior (e.g., avoidance maneuvers). Impacts as a result of these activities are expected for at least some of the individual cetaceans analyzed. Oil spilled from tankers (OCS and non-OCS), production platforms, and pipelines is expected to at least cause sublethal effects such as skin and eye irritation in any cetacean contacted. If an oil spill occurred under condition that would trap a few young or weakened individuals of gray, bowhead, and beluga whales, it is estimated that a few individuals may be killed as a result of the toxic effects of exposure to spilled oil. A temporary reduction in feeding efficiency caused by oil fouling may occur in baleen whales, and it is possible that a small part of some cetacean's prey or feeding habitat may be temporarily lost or degraded in the areas of spilled oil. Impacts on harbor porpoises are expected to result primarily from mortality caused by entanglement in fishing nets. As a nearshore species it may be adversely affected by organic pollutants found in nearshore waters.

**CONCLUSION:** Under Alternative II, the cumulative level of impact on whales is expected to be very low (fin, humpback, right, blue, sei, sperm, minke) or low (bowhead, gray, beluga). The level of cumulative impact on the harbor porpoise is expected to be moderate.

(2) Pinnipeds

Contact with spilled oil from OCS and non-OCS activity is expected to result in mostly sublethal effects (e.g., skin and eye irritation) on adult pinnipeds. Lethal effects on some very young animals are expected due to oil exposure, especially where oil directly contacts pinniped rookeries or adults carry oil from areas of spills to rookeries. Among the pinnipeds analyzed, cumulative impacts are expected to be greater for the stellar sea lion and the Pacific walrus than for most others. The principal reasons for expecting higher impacts in these two species are that a large segment of the stellar sea lion population is in an unexplained state of decline, and that a relatively large impact from oil spill exposure (mostly non-OCS) is projected for the Pacific walrus. Mortality associated with commercial fishing and subsistence activities is expected to result in small population declines for some pinniped species. Noise and other disturbances caused by human activities may alter the breeding and pupping activities of some pinnipeds, but the impacts are not expected to be substantive.

The level of cumulative impact on the northern fur seal is expected to be lower under this alternative than for Alternative I. The northern fur seal is very sensitive to contact with spilled oil because its pelage (rather than a thick fat layer) insulates it from the cold. Contact with oil can render pelage ineffective as insulation, and the result can be fatal hypothermia. It is presumed that the cumulative frequency of northern fur seal exposures to large oil spills that occur near high concentrations of animals (i.e., Pribilof Islands - Unimak Pass) will be lower under this alternative. Eliminating the St. George Basin and Navarin Basin Planning Areas from the current and future programs would preclude the occurrence of the estimated 17 large spills associated with future development of these areas. This represents a significant reduction in cumulative risk to the species, and it is expected that the population recovery would be more

successful after being exposed to oil. Some oil spill impacts on northern fur seals are expected under this alternative as the result of oil-related exposure associated with other cumulative oil spills estimated to occur from existing and proposed activities. Individual are also expected to suffer sublethal effects that may result in reduced reproduction, or changes in distribution of the population. Few other program-related impacts on northern fur seals are expected. Some occasional disturbances of rookeries caused by air traffic may occur, but these are expected to be minor and result in little change in species distribution or numbers.

**CONCLUSION:** The cumulative impacts on pinnipeds Under Alternative II are expected to be very low for northern elephant seals, guadalupe fur seals, and california sea lions, low for ice seals and harbor seals, and moderate for stellar sea lions, the Pacific walrus, and the northern fur seal.

### (3) Polar Bears

Principal impacts are expected to be displacement of pregnant females from preferred denning areas caused by human disturbance, loss of some prey species (especially ringed and bearded seals) due to oil spills, and infrequent mortality from direct contact with spilled oil. Cumulative activities not related to this alternative (i.e., current and future OCS leasing programs) are likely to cause most of these impacts.

**CONCLUSION:** A moderate level of cumulative impact is expected for polar bears under Alternative II.

### b. Coastal and Marine Birds

#### (1) Endangered Bird Species

Cumulative impacts on the endangered and threatened bird species analyzed are expected to include reduced reproductive (i.e., breeding, chick-rearing) success caused by habitat degradation (e.g., oil contamination, noise) or destruction (e.g., deforestation, coastal development), and varying levels of direct mortality caused by contact with spilled oil, ingestion of oil contaminated prey or other materials (such as discarded plastics), and entanglement in fishing gear. Among the endangered birds analyzed, the California least tern is expected to incur the greatest cumulative impact. Those impacts are associated with habitat loss or modification, and oil spill contacts with nesting areas in southern California. Cumulative activities not related to this alternative (i.e., current and future OCS leasing programs) are expected to cause most of the impacts to endangered birds.

**CONCLUSION:** Under Alternative II, the level of cumulative impact on the American peregrine falcon, bald eagles in the Pacific Region, and the short-tailed albatross is expected to be low. Moderate cumulative impacts are expected for the California brown pelican and bald eagles in Alaska Region. The California least tern is expected to experience a high level of cumulative impact.

#### (2) Geese, Diving Ducks, Waterfowl

The principal cumulative impact associated with this alternative is mortality associated with contact with spilled oil. Waterfowl, diving ducks, and geese are particularly vulnerable to spilled oil when they are molting, or concentrated in wintering or staging areas. In addition, the migration routes of most of these species cover several planning areas where they could be exposed to oil spilled from OCS or non-OCS activities. Under this alternative, all species are presumed to be contacted by one or more large oil spills, either from OCS or non-OCS sources. The level of cumulative impact is expected to vary with species, and depends primarily on how long it would take for the population of species to recover after being affected by a large oil spill. Geese and diving ducks are expected to recover more slowly than waterfowl. Any OCS



oil spilled as a result of adopting this alternative is expected to contribute to the cumulative impacts.

**CONCLUSION:** The cumulative level of impact on all goose species analyzed (white-fronted, emperor, cackling canada, pacific black brant, and other) and diving ducks is expected to be moderate. Cumulative impacts on waterfowl are expected to be low under Alternative II.

### (3) Seabirds

For other seabird species the level of OCS activity and the potential risks of oil spills that are important in projecting the level of cumulative impacts are not substantively reduced as compared with Alternative I. The principal cumulative impacts expected under this alternative include mortality from contact with spilled oil (OCS and non-OCS) and entanglement in fishing nets, and behavioral changes (e.g., nest desertion) leading to reduced reproduction or adult mortality caused by human presence (e.g., noise from vessel traffic). Recovery from these impacts is expected to take less than one generation.

The level of cumulative impact on alcid species is expected to be lower under this alternative than for Alternative I. Alcids (especially Murres and Auklets) are slower to recover from man-caused mortalities than most other seabird species. St. Matthew-Hall and the Pribilof Islands and Unimak Pass areas probably support the largest populations of alcid species (mostly murres and auklets) in the north Pacific Ocean. Like most seabirds, alcid species are very sensitive to oil, and direct contact usually results in mortality. Under Alternative II, 17 of those spills would be precluded because no future leasing would occur in the St. George Basin and Navarin Basin Planning Areas. As a result, fewer exposures to large spills are presumed, with a corresponding decrease in expected oil-related mortality. Lethal and sublethal impacts are expected under this alternative, however. Oil spills from areas where leasing or OCS and non-OCS oil transportation would occur (e.g., Chukchi Sea, Washington, and Oregon Planning Areas) are expected to cause some alcid mortality in the cumulative sense. In addition, disturbances of nesting areas from air and vessel traffic are expected to have some sublethal effects (e.g., nest abandonment) that may reduce reproductive levels or change species distribution. However, alcid species are expected to recover from these impacts in less than one generation under this alternative, as opposed to requiring more than one generation under the proposal.

**CONCLUSION:** The cumulative level of impact on seabirds, including alcid species, is expected to be moderate under Alternative II.

### (4) Shorebirds

The cumulative impact on shorebirds under this alternative is expected to be the same as described in Section IV.D.2.b. Impacts expected under this alternative include direct mortality from contact with spilled oil (especially in wetlands and estuaries), indirect mortality from loss of habitat (principally winter habitat), and reduced reproductive capacity. Continued loss of shorebird habitat is expected to be the major cause of cumulative impacts.

**CONCLUSION:** The level of cumulative impact on shorebirds is expected to be low under Alternative II.

## c. Fish Resources

### (1) Pacific Salmon

Major causes of cumulative impacts on Pacific salmon are expected to be fishing, degradation or loss of freshwater spawning habitat (especially in Pacific Region), and accidental oil spills from OCS and non-OCS sources. Future losses of juvenile and adult salmon to fish harvesting are expected to be highly variable. The more sensitive and vulnerable life stages of salmon when exposed to oil are outmigrating smolts, nearshore feeding juveniles, and adults that are

beginning to ascend their home rivers to spawn. However, these impacts are expected to be localized. Impacts under this alternative include direct mortality from contact from spilled oil, indirect mortality from habitat loss, and over harvesting of the species.

**CONCLUSION:** Under Alternative II the cumulative levels of impact on Pacific salmon are expected to be very low in the Alaska Region, and moderate in the Pacific Region.

#### (2) Walleye Pollock

Walleye pollock are expected to experience the greatest cumulative impact from commercial fishing which currently results in the harvest of large amount of juvenile and adult fish. Other cumulative impacts expected include loss of relatively small numbers of fish eggs and larvae to the toxic effects of contact with spilled oil. Discharges from offshore drilling activity may produce toxic effects to a few individual fish, but no substantive impacts are expected from this activity. Oil and gas development activity is expected to be a minor factor in the cumulative impacts to the species. Overall, very little cumulative impact is expected on walleye if continued "maximum sustainable yield" fishery management philosophies are employed.

**CONCLUSION:** The level of cumulative impact on walleye pollock is expected to be very low under Alternative II.

#### (3) Steelhead Trout

Impacts on steelhead trout under this alternative are expected to be the same as those described in Section IV.D.3.c. The greatest causes of cumulative impact to steelhead trout are expected to be loss of degradation of freshwater habitat and fishing. Impacts associated with fishing (sport and Indian treaty) and habitat loss are expected to be loss of adult fish and reduced reproduction. Oil spills caused by offshore production and transportation activities (OCS and non-OCS) are expected to have the greatest effects on outmigrating smolts and juvenile steelhead. The most sensitive areas for oil spills will be near the mouths of spawning streams where impacts to outmigrating smolts could be reflected in direct mortality and/or reduced survivability. Spills associated with coastal tanker transportation activities are expected to be the major cause of oil-related impacts. Temporary displacement/redistribution of some juvenile and adult fish are expected to be affected by offshore seismic survey activities and drilling discharges, but impacts are expected to be minor because of dispersed nature of activities and fish.

**CONCLUSION:** The cumulative level of impact on steelhead trout is expected to be moderate under Alternative II.

#### (4) Pacific Whiting

The principal human-induced cumulative impact on Pacific whiting is expected to be the commercial harvest of juvenile and adult fish. OCS and non-OCS oil spills are expected to produce toxic impacts on some eggs and larvae, but it is not expected that the effects will be substantive because of the wide distribution of these life stages of whiting in offshore areas. Some small-scale, lethal or sub-lethal impacts all Pacific whiting life stages are expected from seismic survey activities or temporary exposure to drilling discharges.

**CONCLUSION:** The cumulative level of impact on Pacific whiting is expected to be moderate under Alternative II.

### 3. Alternative III - Phased OCS Development

An alternative to "stagger" or "phase" OCS development in the Alaska and Pacific Region was developed to determine if changes in the timing of impact causing activities would measurably reduce the level of impact expected as a result activities associated with the current and



possibly future 5-year programs. Lease sales would be held in the Chukchi Sea, Beaufort Sea, and Navarin Basin Planning Areas during the current and possibly future 5-year programs. Several factors were considered in selecting these planning areas for analysis: whether oil and gas activities were currently taking place; the likelihood of finding oil and gas; and the status of the lease sale schedule. The remaining planning areas within the regions would be deferred from leasing.

The Secretary's implementation of this alternative requires decisions beyond the scope of this 5-year program. Pursuant to section 18 of the OCSLA, as amended, 43 U.S.C. §1344, the Secretary's decision on the size, timing, and location of leasing activities is restricted to the 5-year period of the 1987 Program. In addition, any suspension or temporary prohibition of any operation or activity (development or production) pursuant to any lease is governed by section 5 of the OCSLA, as amended, 43 U.S.C. §1334.

For the purpose of analysis, it is assumed that no new oil and gas exploration, development, and production would occur in the deferred planning areas as a result of the past, current or future 5-year programs with the exception of the Southern California Planning Area. Under this Alternative, there would be no new leases as a result of the current and future program in the Southern California Planning Area.

The cumulative impacts on most of the migratory species analyzed are expected to be like those described for Alternative I because the level of OCS activity and the potential risks of oil spills that are important in projecting the level of cumulative impacts on most migratory species are not substantively reduced as compared to Alternative I. The impacts associated with non-OCS activities would be the same as those described for Alternative I because the activities considered are the same for both alternatives.

#### a. Marine Mammals

##### (1) Cetaceans

The level of OCS exploration, development, and production activities and the potential risks of oil spills that are important in projecting the level of cumulative impacts on cetaceans are not substantively reduced under this alternative as compared with Alternative I. Noise associated with OCS and non-OCS activity in offshore areas is expected to result in temporary and non-lethal disturbances in animal behavior (e.g., avoidance maneuvers). Impacts as a result of these activities are expected for at least some of the individual of the cetaceans analyzed. Oil spilled from tankers (OCS and non-OCS), production platforms, and pipelines is expected to at least cause sublethal effects such as skin and eye irritation in any cetacean contacted. If an oil spill occurred under condition that would trap a few young or weakened individuals of gray, bowhead, and beluga whales, it is estimated that a few individuals may be killed as a result of the toxic effects of exposure to spilled oil. A temporary reduction in feeding efficiency caused by oil fouling may occur in baleen whales, and it is possible that a small part of some cetacean's prey or feeding habitat may be temporarily lost or degraded in the areas of spilled oil. Impacts on harbor porpoises are expected to result primarily from mortality caused by entanglement in fishing nets. As a nearshore species it may be adversely affected by organic pollutants found in nearshore waters.

**CONCLUSION:** Under Alternative III, the cumulative level of effect on whales is expected to be very low (fin, humpback, right, blue, sei, sperm, minke) or low (bowhead, gray, beluga). The level of cumulative impact on the harbor porpoise is expected to be moderate.

##### (2) Pinnipeds

Contact with spilled oil from OCS and non-OCS activity is expected to result in mostly sublethal effects (e.g., skin and eye irritation) on adult pinnipeds. Lethal effects on some very

young animals are expected due to oil exposure, especially where oil directly contacts pinniped rookeries or adults carry oil from areas of spills to rookeries. Among the pinnipeds analyzed, cumulative impacts are expected to be greater for the stellar sea lion and the Pacific walrus than for most others. The principal reasons for expecting higher impacts in these two species are that a large segment of the stellar sea lion population is in an unexplained state of decline, and that a relatively large impact from oil spill exposure (mostly non-OCS) is projected for the Pacific walrus. Mortality associated with commercial fishing and subsistence activities is expected to result in small population declines for some pinniped species. Noise and other disturbances caused by human activities may alter the breeding and pupping activities of some pinnipeds, but the impacts are not expected to be substantive.

For northern fur seals, impacts from possible OCS-related oil spills in the Navarin Basin Planning Areas are expected to be substantive. Mortality associated with commercial fishing and subsistence activities is expected to result in small population declines for some pinniped species. Noise and other disturbances caused by human activities may alter the breeding and pupping activities of some pinnipeds, but the impacts are not expected to be substantive.

The level of cumulative impact on the northern fur seal is expected to be lower under this alternative. The northern fur seal is very sensitive to contact with spilled oil because its pelage (rather than a thick fat layer) insulates it from the cold. Contact with oil can render pelage ineffective as insulation, and the result can be fatal hypothermia. It is presumed that the cumulative frequency of northern fur seal exposures to large oil spills that occur near high concentrations of animals (i.e., Pribilof Islands - Unimak Pass) will be lower under this alternative. Eliminating the St. George Basin Planning Area from the current and future programs would preclude the occurrence of the estimated 4 large spills associated with future development of this area. This represents a significant reduction in cumulative risk to the species, and it is expected that the population recovery would be more successful after being exposed to oil. Some oil spill impacts on northern fur seals are expected under this alternative as the result of oil-related exposure associated with other cumulative oil spills estimated to occur from existing and proposed activities. Individuals are also expected to suffer sublethal effects that may result in reduced reproduction, or changes in distribution of the population. Few other program-related impacts on northern fur seals are expected. Some occasional disturbances of rookeries caused by air traffic may occur, but these are expected to be minor and result in little change in species distribution or numbers.

**CONCLUSION:** The cumulative impacts on pinnipeds under Alternative III are expected to be very low for northern elephant seals, guadalupe fur seals, and California sea lions, low for ice seals and harbor seals, and moderate for stellar sea lions, the Pacific walrus, and the northern fur seal.

### (3) Polar Bears

Principal impacts are expected to be displacement of pregnant females from preferred denning areas caused by human disturbance, loss of some prey species (especially ringed and bearded seals) due to oil spills, and infrequent mortality from direct contact with spilled oil. Cumulative activities not related to this alternative (i.e., current and future OCS leasing programs) are likely to cause most of these impacts.

**CONCLUSION:** A moderate level of cumulative impact is expected for polar bears under Alternative III.



## **b. Coastal and Marine Birds**

### **(1) Endangered Bird Species**

Cumulative impacts on the endangered and threatened bird species analyzed are expected to include reduced reproductive (i.e., breeding, chick-rearing) success caused by habitat degradation (e.g., oil contamination, noise) or destruction (e.g., deforestation, coastal development), and varying levels of direct mortality caused by contact with spilled oil, ingestion of oil contaminated prey or other materials (such as discarded plastics), and entanglement in fishing gear. Among the endangered birds analyzed, the California least tern is expected to incur the greatest cumulative impact. Those impacts are associated with habitat loss or modification, and oil spill contacts from existing OCS and non OCS oil development and transportation with nesting areas in southern California. Cumulative activities not related to this alternative (i.e., current and future OCS leasing programs) are expected to cause most of the impacts to endangered birds.

**CONCLUSION:** Under this Alternative III, the level of cumulative impact on the American peregrine falcon, bald eagles in the Pacific Region, and the short-tailed albatross is expected to be low. Moderate cumulative impacts are expected for the California brown pelican and bald eagles in Alaska Region. The California least tern is expected to experience a high level of cumulative impact.

### **(2) Geese, Diving Ducks, Waterfowl**

Under this alternative, the levels of impacts on geese, diving ducks, and waterfowl are expected to be the same as discussed in Section IV.D.2.b. The principal cumulative impact associated with this alternative is mortality associated with contact with spilled oil. Waterfowl, diving ducks, and geese are particularly vulnerable to spilled oil when they are molting, or concentrated in wintering or staging areas. In addition, the migration routes of most of these species cover several planning areas where they could be exposed to oil spilled from OCS or non-OCS activities. Under this alternative, all species are presumed to be contacted by one or more large oil spills, either from OCS or non-OCS sources. The level of cumulative impact is expected to vary with species, and depends primarily on how long it would take for the population of species to recover after being affected by a large oil spill. Geese and diving ducks are expected to recover more slowly than waterfowl. Any OCS oil spilled as a result of adopting this alternative is expected to contribute to the cumulative impacts.

**CONCLUSION:** The cumulative level of impact on all goose species analyzed (white-fronted, emperor, cackling canada, pacific black brant, and other) and diving ducks is expected to be moderate. Cumulative impacts on waterfowl are expected to be low under Alternative III.

### **(3) Seabirds**

The level of OCS activity and the potential risks of oil spills that are important in projecting the level of cumulative impacts are not substantively reduced as compared with Alternative I. The principal cumulative impacts expected under this alternative include mortality from contact with spilled oil (OCS and non-OCS) and entanglement in fishing nets, and behavioral changes (e.g., nest desertion) leading to reduced reproduction or adult mortality caused by human presence (e.g., noise from vessel traffic). Impacts are expected to be greatest on Alcid species (especially auklets and murre) because it would probably take longer for these species to recover from population declines associated with oiling. Under this alternative the estimated mean number of oil spills is 23, impacts to seabirds located in the vicinity of St. Matthew-Hall and Pribilof Islands and the Unimak Pass area would be subject to oil spills as a result of the potential development, production, and the transportation of oil from the Navarin Basin Planning Area. Recovery from cumulative impacts are expected to take less than one generation, except for alcid species.

**CONCLUSION:** The cumulative level of impact on all seabirds, except alcids, is expected to be moderate under Alternative III. A high level of cumulative impact is expected for alcids.

#### (4) Shorebirds

Impacts expected under this alternative include direct mortality from contact with spilled oil (especially in wetlands and estuaries), indirect mortality from loss of habitat (principally winter habitat), and reduced reproductive capacity. Continued loss of shorebird habitat is expected to be the major cause of cumulative impacts.

**CONCLUSION:** The level of cumulative impact on shorebirds is expected to be low under Alternative III.

#### c. Fish Resources

##### (1) Pacific Salmon

Major causes of cumulative impacts on Pacific salmon are expected to be fishing, degradation or loss of freshwater spawning habitat (especially in Pacific Region), and accidental oil spills from OCS and non-OCS sources. Future losses of juvenile and adult salmon to fish harvesting is expected to be highly variable. The more sensitive and vulnerable life stages of salmon when exposed to oil are outmigrating smolts, nearshore feeding juveniles, and adults that are beginning to ascend their home rivers to spawn. However, these impacts are expected to be localized. Impacts under this alternative include direct mortality from contact from spilled oil, indirect mortality from habitat loss, and over harvesting of the species.

**CONCLUSION:** Under Alternative III, the cumulative levels of impact on Pacific salmon are expected to be very low in the Alaska Region, and moderate in the Pacific Region.

##### (2) Walleye Pollock

Walleye pollock are expected to experience the greatest cumulative impact from commercial fishing which currently results in the harvest of large amounts of juvenile and adult fish. Other cumulative impacts expected include loss of relatively small numbers of fish eggs and larvae to the toxic effects of contact with spilled oil. Discharges from offshore drilling activity may produce toxic effects to a few individual fish, but no substantive impacts are expected from this activity. Oil and gas development activity is expected to be a minor factor in the cumulative impacts to the species. Overall, very little cumulative impact is expected on walleye if continued "maximum sustainable yield" fishery management philosophies are employed.

**CONCLUSION:** The level of cumulative impact on walleye pollock is expected to be very low under Alternative III.

##### (3) Steelhead Trout

The greatest causes of cumulative impact to steelhead trout are expected to be loss of degradation of freshwater habitat and fishing. Impacts associated with fishing (sport and Indian treaty) and habitat loss are expected to be loss of adult fish and reduced reproduction. Oil spills caused by offshore production and transportation activities (OCS and non-OCS) are expected to have the greatest effects on outmigrating smolts and juvenile steelhead. The most sensitive areas for oil spills will be near the mouths of spawning streams where impacts to outmigrating smolts could be reflected in direct mortality and/or reduced survivability. Spills associated with coastal tanker transportation activities are expected to be the major cause of oil-related impacts. Temporary displacement/redistribution of some juvenile and adult fish are expected to be affected by offshore seismic survey activities and drilling discharges, but impacts are expected to be minor because of the dispersed nature of activities and fish.



**CONCLUSION:** The cumulative level of impact on steelhead trout is expected to be moderate under Alternative III.

#### **(4) Pacific Whiting**

The principal human-induced cumulative impact on Pacific whiting is expected to be the commercial harvest of juvenile and adult fish. OCS and non-OCS oil spills are expected to produce toxic impacts on some eggs and larvae, but it is not expected that the effects will be substantive because of the wide distribution of these life stages of whiting in offshore areas. Some small-scale, lethal or sub-lethal impacts to all Pacific whiting life stages are expected from seismic survey activities or temporary exposure to drilling discharges.

**CONCLUSION:** The cumulative level of impact on Pacific whiting is expected to be moderate under Alternative III.

#### **4. Alternative IV - No Action (Cancel the 1987 Program in the Alaska and Pacific Regions)**

The evaluation of a "no action" alternative is required by the regulations implementing NEPA (40 CFR 1502.14(d)). For the purpose of this analysis only, this alternative assumes that the remaining lease sales within the Alaska and Pacific Regions will be cancelled for the remainder of the period covered by the 5-year program approved by the Secretary on July 2, 1987. This alternative would constitute the most extreme level of mitigation to eliminate simultaneous development.

Under this alternative the only Federal oil and gas activities in the Pacific and Alaska Regions would be from previously leased areas. The oil and gas resources that would have become available as a result of the current 5-year program would be foregone. Therefore, that amount of energy would have to be made up by either alternative energy sources or conservation.

A comparison of the effects from past, ongoing and projected non-OCS activities, and past and ongoing OCS activities and the current and future 5-year programs indicates that the 5-year programs do not increase impacts to migratory species above impact levels from past, ongoing and projected non-OCS activities, and past and ongoing OCS activities, with the exception of the northern fur seal and certain species of seabirds. Past, ongoing and future non-OCS and past and ongoing OCS impact producing factors or agents are currently causing a moderate level of impact to the northern fur seal (see Section IV.D.1.c) and seabird (see Section IV.D.2.e). Based on the analysis of estimated mean number of oil spills as a consequence of the addition of the current and future 5-year programs the expected level of the overall cumulative impacts to these species is high. It was determined based on the analysis in Section IV.D.1.c and IV.D.2.e that the contributing factor to the increased likelihood of oil spill contacting the northern fur seals and certain species of seabirds is from potential oil development and transportation in the St. George Basin and Navarin Basin Planning Areas.

The deferral of the development and transportation of oil resources associated with the planning areas in the Alaska and Pacific regions during this and future 5-year programs would reduce and in some cases eliminate the cumulative risk of oil spill contacts to the northern fur seal and seabird populations concentrated in the Bering Sea. With the elimination of exposure to oil spill the impacts to these species would be as a result of past, ongoing, and projected non-OCS activities and past, and ongoing OCS activities (see Sections IV.D.1.c and IV.D.2.e). Impacts from these sources are expected to result in a moderate impact to these species.

The deferral of leasing in these planning areas would also result in the elimination of all potential impact as a result of the exploration development, and production activities on all components of the physical, biological, and socioeconomic environment within the planning

areas. Impacts to these resources which would be avoided by the deferral of these planning areas are analyzed in Section IV.D. of the FEIS.

**CONCLUSION:** In general, the No Action Alternative (i.e., the deferral of the remaining sales on the schedule in the Alaska and Pacific Regions) would not reduce the level of cumulative impacts to the various migratory species (marine mammals, fish resources, and coastal and marine birds) with the exception of the northern fur seal and certain species of seabirds as compared with Alternative I. However, this alternative would constitute the most extreme level of mitigation to eliminate simultaneous development.



# **CHAPTER V**

## **CONSULTATION AND COORDINATION**

## **V. CONSULTATION AND COORDINATION**

### **A. Draft SEIS**

The SEIS tiers directly from the FEIS; therefore, issues and concerns presented in the Consultation and Coordination Section of the FEIS which pertain to the preparation of the SEIS were taken into consideration during its development.

Information used in the preparation of the SEIS was obtained from a number of sources. Sale specific documents prepared for individual lease sales were an important source of data on the affected environment, the species which have been of concern in the past, the factors which may affect those species, how those species are affected by various offshore activities, and how the species have been affected in the past.

Additional information was obtained from contacts established within the academic community, Federal Agencies, State and local governments, and the oil and gas industry.

In developing the scope of the SEIS, MMS focused on the inadequacies identified by the court. The court's guidelines were taken into consideration during the development of the scope of the SEIS, including suggestion that the Secretary could;

- a) examine cumulative impacts of simultaneous inter-regional Outer Continental Shelf (OCS) development in a single, coherent section rather than fragment his analysis by area;
- b) identify the various migratory species and the full range of their routes of migration, describe the OCS and non-OCS activities along those routes, and state the synergistic effects of those activities on the migratory species;
- c) support such a presentation with references to scientific studies and other materials so that a decisionmaker would have ready access to the information underlying the Secretary's findings and conclusions;
- d) consider alternatives to the proposed action, examine alternatives to simultaneous development that would mitigate any synergistic impacts on migratory species; and
- e) set out the pros and cons of various alternatives and explain his reasons for adopting whatever course of action he decided upon.

The MMS also consulted with EPA on January 17, 1989 to discuss concerns expressed by EPA in their May 9, 1986 letter on the DEIS for the Proposed 5-Year Program. The suggestions outlined by the court and the concerns expressed by EPA were taken into consideration during the preparation of the SEIS.

### **B. Distribution Of The Draft SEIS**

The draft SEIS was available for public inspection at the MMS offices in the Alaska, Pacific, Gulf of Mexico, and Atlantic OCS Regions. Copies of the draft SEIS were also available for review in public libraries located throughout the coastal States. Approximately 1,000 copies were distributed for review to Federal, State and local agencies and interested groups and individuals.

The final SEIS will be available for public inspection at the same locations noted above. The final SEIS will be distributed to Federal, State and local agencies and interested groups and individuals, as well as those organization and individuals that commented on the adequacy of the draft SEIS and those who requested the final SEIS.



## **C. Comments Received On The Draft SEIS**

### **1. Public Hearings For The Draft SEIS**

Public hearings were held on the following locations and dates: Portland, Oregon on September 26, 1989; and Sacramento, California, and Anchorage, Alaska on September 28, 1989. All testimony was recorded and transcribed and transcripts are open to public inspection in the Minerals Management Service 381 Elden Street Herndon, Virginia. Two speakers gave testimony at the public hearings. These speakers indicated their support or opposition to the proposed action. No comments on the adequacy of the draft SEIS or to provide the Secretary of the Interior with additional information to help evaluate fully the potential cumulative environmental effects of the current 5-year program on migratory species were received.

### **2. Written Comments**

A total of 33 comment letters were received from Federal, State and local agencies, and interested groups and individuals. Comments which provided relevant information, raised questions about the adequacy of the draft SEIS, or requested clarification about procedures or analyses, were responded to specifically. Revision in the text were made if deemed required, or appropriate.

#### **Federal**

- F-1 United States Department Of Transportation  
United States Coast Guard
- F-2 United States Nuclear Regulatory Commission
- F-3 United States Environmental Protection Agency
- F-4 United States Department Of State
- F-5 Nancy Pelosi Member Of Congress
- F-6 Marine Mammal Commission
- F-7 National Oceanic And Atmospheric Administration
- F-8 United States Fish and Wildlife Service

#### **State**

- S-1 State Of California Department Of Justice
- S-2 State Of California Department Of Environmental Affairs
- S-2a California Department Of Parks And Recreation
- S-2b California Department Of Water Resources
- S-2c California Water Resources Control Board
- S-2d County Of Santa Cruz
- S-2e City Of Carlsbad
- S-2f County Of San Diego
- S-3 State Of California California Coastal Commission
- S-4 State Of California State Lands Commission
- S-5 State Of Washington
- S-6 State Of Alaska
- S-7 State Of South Carolina
- S-8 State Of Mississippi
- S-9 State Of Maryland

- S-10 State Of Pennsylvania
- S-11 State of Oregon\*
- S-11a County of Coos
- S-11b County of Curry
- S-11c State Historical Preservation Office
- S-11d Department of Environmental Quality
- S-11e Oregon State Fish and Wildlife
- S-12 State of Alabama\*

\*Several letters could not be reproduced legibly, and therefore were not printed in the SEIS. However, a summarization and response to the comments contained in these letters were included in the SEIS.

### **Industry**

- I-1 Alaska Oil And Gas Association
- I-2 American Petroleum Institute

### **Local Governments And Organizations**

- L-1 Calpirg
- L-2 City Of Capitola
- L-3 City Of Santa Cruz
- L-4 Natural Resources Defense Council
- L-5 Northwest Indian Fisheries Commission
- L-6 Cenaliulriit
- L-7 Oregon Natural Resources Council
- L-8 Central Coast OCS Regional Studies Program
- L-9 Washington State Coastal Counties
- L-10 Coastal Resources Center
- L-11 Nunam Kitutsisti



U.S. Department  
of Transportation  
United States  
Coast Guard



Commandant G-MPS-1  
United States Coast Guard

REGULATORY ADDRESS:  
2100 Second St. S.W.  
Washington, DC 20593  
(202) 267-0504

F1

16400

26 SEP 1989

Associate Director for Offshore Minerals Management  
Minerals Management Service  
Mail Stop 644  
ATTN: Branch of Environmental Evaluation  
381 Eldon Street  
Norndon, Virginia 22070

Dear Sir:

This is in response to your letter of August 16, 1989, transmitting the draft Supplemental Environmental Impact Statement (SEIS) for the 5-Year Outer Continental Shelf Oil and Gas Leasing Program Mid-1987 to Mid-1992. We have reviewed the SEIS and have no comments to offer. F1.1

We appreciate the opportunity to review the SEIS for the 5-Year Outer Continental Shelf Oil and Gas Leasing Program Mid-1987 to Mid-1992.

Sincerely,

R. P. D'AMICO  
Commander, U. S. Coast Guard  
Chief, Port Operations Branch  
Port Safety and Security Division  
By direction of the Commandant



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20545

F2

OCT 12 1989

Associate Director for Offshore  
Minerals Management  
Minerals Management Service  
ATTN: Branch of Environmental Evaluation  
U.S. Department of the Interior  
M.S. 644  
381 Eldon Street  
Norndon, Virginia 22070

Dear Sir:

In response to your letter dated August 16, 1989 to the Nuclear Regulatory Commission, we have reviewed the draft Supplemental Environmental Impact Statement (SEIS) for the 5-Year Outer Continental Shelf Oil and Gas Leasing Program Mid-1987 to Mid-1992. Our review was directed to whether the action described in the SEIS involved matters within our jurisdiction by law or had any potential impact on NRC licensed activities. No potential impacts were identified in our review. Therefore, we have no comments on the draft SEIS. F2.1

Thank you for the opportunity to review the draft SEIS for the 5-Year Program.

Sincerely,

THOMAS E. HURLEY, Director  
Office of Nuclear Reactor Regulation

V4



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

OCT 17 1989

OFFICE OF  
ENFORCEMENT AND  
COMPLIANCE MONITORING

Mr. Barry Williamson  
Director  
Minerals Management Service  
Department of the Interior  
Washington, D.C. 20240

Dear Mr. Williamson:

The Environmental Protection Agency (EPA), in accordance with its responsibilities under the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act, has reviewed the draft Supplemental Environmental Impact Statement (SEIS) for the 5-year Outer Continental Shelf (OCS) oil and gas leasing program.

On December 30, 1988, the U.S. Court of Appeals for the District of Columbia ruled that the final Environmental Impact Statement (EIS) for the Proposed 5-year Outer Continental Shelf (OCS) Oil and Gas Leasing Program, mid-1987 to mid-1992, failed to adequately analyze the cumulative impacts of the proposed leasing program on migratory species. As a result, the Department of Interior's Minerals Management Service (MMS) has analyzed the effects of the current and future 5-year programs plus existing OCS and non-OCS activities on migratory species whose migration routes traverse more than one planning area in the Pacific and Alaska OCS Regions.

The SEIS does a good job of describing the range of existing and potential activities occurring on the OCS as well as the non-OCS activities that could affect migratory species. The life history information is also well done. The discussion for each species portrays species distribution, life cycle stages, distribution of various life stages, population status, areas of concentration, and trophic relationships. The draft SEIS also points out the information gaps that exist with regard to these specific topics for each species evaluated.

However, EPA has two primary concerns about the evaluation presented in the SEIS. The cumulative impact level definitions are too broad including failure to make any distinction between threatened and endangered species and nonendangered species. Also, the analysis has not fully addressed additive or synergistic responses to exposure to multiple activities.

F3.1

F3.2

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F3

2

Cumulative Impact Level Definitions

The cumulative impact level definitions are too broad. A wide range of impact intensity is encompassed within each category. We are concerned that the draft SEIS appears to dismiss impacts which do not fall into the "high" category. EPA believes additional consideration should also be given to impacts defined in this document as "moderate."

F3.3

F3.4

MMS classified all sublethal impacts as "very low." EPA disagrees with this definition and believes that such impacts also merit concern. For example, the effects of submarine noises generated from aircraft, boats and ships or seismic exploration on cetaceans are not fully understood, and yet could pose indirect stresses to whale and porpoise species. OCS oil and gas activities usually involve some combination of these types of activities. Sublethal effects could be significant in the long term, especially the 30 to 40 year time frame of this analysis.

F3.5

The draft SEIS does not distinguish between threatened or endangered species (T&E species) and nonendangered species in the impact level definitions. Endangered species have low abundance and are often vulnerable and less resilient to impacts (the basic reason for their endangered status). We agree with the final EIS for the current 5-year leasing program that "an adverse impact to individuals of these species (T&E species) would be more significant than individuals of non-threatened or endangered animals." We believe that the effects on T&E species should be judged or measured more stringently than for non-T&E species.

F3.6

Additive and Synergistic Responses

Most migratory species will likely be exposed to multiple activities such as those described above, throughout their migratory range and potential additive or synergistic effects resulting from exposure to multiple activities need to be clearly addressed. The draft SEIS attempts to evaluate the incremental contribution from the current and future leasing programs. Statements similar to "the incremental addition is not expected to increase the level of impact to this species above the current existing levels" are found throughout the environmental consequences chapter. These statements imply that an additive process was used to determine the cumulative effects (existing levels + current and future program levels). The final SEIS should include a detailed explanation of the analytical approach that was used to establish the existing levels of impact and the incremental contribution to impact levels from the current and future leasing program. The quantifiable basis to support these statements and conclusions should be presented in the final SEIS.

F3.7

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Because of these concerns we have rated the draft SEIS "BC" (Environmental Concerns), and the information presented in the draft SEIS as "2" (Insufficient Information). A sheet describing EPA's rating system is enclosed for your information.

We are providing specific comments on various issues with page and paragraph citations. If you have any questions concerning this matter please call me at (PIS 383-5053) or Craig Hooks (383-9906) of my staff.

Sincerely,

*Richard E. Sanderson*  
 Richard E. Sanderson  
 Director  
 Office of Federal Activities

Enclosures

**SUMMARY OF THE EPA RATING SYSTEM  
 FOR DRAFT ENVIRONMENTAL IMPACT STATEMENTS:  
 DEFINITIONS AND FOLLOW-UP ACTION \***

Environmental Impact of the Action

1A--Lack of Objections

The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

1C--Environmental Concerns

The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA intends to work with the lead agency to reduce these impacts.

1B--Environmental Objections

The EPA review has identified significant environmental impacts that should be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no-action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

1D--Environmentally Unsatisfactory

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the CEQ.

Adequacy of the Impact Statement

Category 1--Adequate

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2--Insufficient Information

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analysis, or discussion should be included in the final EIS.

Category 3--Inadequate

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analysis, or discussion are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

\* From EPA "Manual 1040 Policy and Procedures for the Review of Federal Actions Impacting the Environment"

February, 1987

F3A

**SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT  
5-YEAR OCS OIL AND GAS LEASING PROGRAM 1987 TO 1992  
CUMULATIVE IMPACTS ON MIGRATORY SPECIES  
DETAILED COMMENTS**

We have a number of detailed comments that are page and paragraph specific. We are providing updated information, requesting some clarification, and requesting definition of certain terms.

The descriptions of the types and levels of impact for each species found in Chapter IV are general and qualitative in nature. Phrases such as: low number of individuals, slightly higher oil impacts, somewhat higher oil impacts, significantly greater impacts, small incremental addition, a small portion of a population, modest increase, slight probability of an oil spill occurring, are found throughout the environmental consequences discussion. These phrases are imprecise and can have a number of different meanings depending on the reviewer. The discussion in Chapter IV could be improved by providing a quantitative basis for these descriptive terms.

F3A.1

page IV-8, third paragraph - Dredging and Marine Disposal Activities, (a) Alaska Region - After the second sentence replace the text with the following:

F3A.2

None Harbor sediments were tested by the Corps of Engineers (Corps) and the Environmental Protection Agency (EPA) in 1989 and were found to contain measurable levels of a number of chemical constituents. The COS and EPA are reviewing this new information with regard to suitability of the material for continued ocean disposal.

page IV-8, fourth paragraph - Insert the following sentence before the last sentence in the paragraph:

F3A.3

The Corps administers the permit program for transportation of dredged material for ocean disposal, with independent review and concurrence by EPA.

page IV-13, first paragraph - Lease Sale 97 - Beaufort Sea and Lease Sale 109 - Chukchi Sea should be added to the list.

F3A.4

page IV-16, fourth paragraph - The statement about ambient water quality conditions should be updated with the results from Minerals Management Services water column sampling by Batelle Northwest in June 1989.

F3A.5

page IV-19, first paragraph - The final sentence in the paragraph is speculative and optimistic. Since we do not fully understand the behavioral response of bowhead whales to development and production noise in the confined spring lead system, the conclusion from the Biological Opinion for Lease sale 109 should also be briefly stated to show the uncertainty that exists. The National Marine Fisheries Service (NMFS) Biological Opinion concluded that no effective mitigation measures currently exist

F3A.6

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to avoid or minimize jeopardy to the bowhead whale population from development and production activities in the spring lead system.

F3A.6

page IV-20, fourth paragraph - NMFS should document the information to support concept stated in the final sentence.

F3A.7

page IV-20, last paragraph - Clarify the basis for the conclusion stated in the last sentence with the last sentence in the previous paragraph. The fact that sensitive calves could be exposed to spilled oil from either a large oil spill or multiple oil spills does not appear to be reflected in this statement. Define "a large number of individuals." NMFS should state how long the spring migration takes, and how long it takes for the entire population to go through the lead system.

F3A.8

page IV-22, sixth paragraph - The discussion should clarify the basis for the conclusion that noise and disturbance would not increase the level of impact to gray whales. The draft SEIS states that "these incremental additions would probably be disruptive."

F3A.9

page IV-24, third paragraph - The text states that fin whales are not expected to react much differently to noise than other whale species previously discussed (gray whales). Different species can have different sensitivities to noise. Any of the other whale species discussed in the SEIS could also be more sensitive to noise and disturbance than gray whales. The final SEIS should clarify whether information exists to support this assumption.

F3A.10

page IV-30, third paragraph - The maximum growth rate for the harbor porpoises is not listed.

F3A.11

page IV-39, fourth paragraph - The discussion of the effects on arctic peregrine falcons should be updated by the new water quality information from the Norton Sound mining water quality sampling results.

F3A.12

page IV-78, first paragraph - The discussion on coastal and marine birds which describes that the overall cumulative impacts range is from "low to moderate", should be changed to "low to high" (California Least Tern).

F3A.13

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United States Department of State

Bureau of Ocean and International  
Environmental and Scientific Affairs

Washington, D.C. 20520

11 September 1989

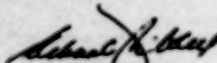
Ms. Debra Purvis  
Branch of Environmental Evaluation  
Minerals Management Service  
Mail Stop 644  
381 Elden Street  
Norfolk, Virginia 23070

Dear Ms. Purvis:

Thank you for giving us the opportunity to review the supplemental EIS on migratory species possibly affected by the 5-Year Outer Continental Shelf Oil and Gas Leasing Program.

We find that the proposed action does not appear to have any impact on the foreign relations of the United States, nor on international environmental issues. The Department of State therefore does not need to comment on the project. We assume you will be clearing this document with the Fish and Wildlife Service.

Sincerely,

  
Deborah M. Odell  
Office of Ecology, Health  
Conservation

F4

F4.1

V8

NANCY PELOSI  
5TH DISTRICT, CALIFORNIA

1600 CONGRESS DRIVE  
WASHINGTON, DC 20515-0505  
(202) 225-4000

OFFICE ADDRESS  
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SAN FRANCISCO, CA 94107-2400  
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Congress of the United States  
House of Representatives  
Washington, DC 20515-0505

CONSTITUENT  
SERVICES, FINANCE  
AND OTHER AFFAIRS  
GOVERNMENT OPERATIONS  
NORTHWEST CALIFORNIA  
AND OREGON  
LEGISLATIVE STAFF GROUP  
EXECUTIVE COMMITTEE

F5

October 17, 1989

Ms. Carolita Kallaur  
Acting Associate Director for  
Offshore Minerals Management  
Minerals Management Service  
Mail Stop 644  
381 Elden Street  
Norfolk, Virginia 23070

Dear Ms. Kallaur:

I am writing to add my comments to the hearing record on the Draft Supplemental Environmental Impact Statement concerning the 5-Year Outer Continental Shelf Oil and Gas Leasing Program.

A thorough environmental review must address adequately the possible effects of any leasing program on migratory species. This is particularly important for the central California coastline where a checkerboard of marine sanctuaries and proposed lease areas exist.

Proposed Lease Sale 119, covering the general coastal area between Monterey north to Sonoma, is home to the Cordell Bank and Pt. Reyes Marine Sanctuaries and the proposed Monterey Bay Marine Sanctuary. Scattered between these marine sanctuaries is the area of Lease Sale 119 where oil drilling platforms are planned. It is inconsistent federal planning to create these marine sanctuaries on the basis of their important marine habitats, including migratory species, and then to devise a scheme that allows development up to their boundaries.

Important breeding grounds for seabirds are located in and around the sanctuaries where species such as Alcaids, Loons, Grebes, and Brown Pelicans exist during certain seasons. There are also critical marine mammal migration paths for California sea lions, whales and dolphins. Almost one third of the north Pacific population of Humpback Whales depends on these waters, and virtually the entire coastal population of gray whales pass through the lease sale area. The Blue and Humpback Whales are endangered species that could be seriously threatened by any oil disaster along the central California coast.

F5.1

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Hallibur  
October 17, 1989

Page 2

The Supplemental DEIS should include a review of tanker spills, as well as platform spills. It should also address the possible impacts from small spills which are very common. Even small amounts of oil ingested by seabirds can destroy populations as a result of internal damage. In 1984, the *Florida Rican* tanker erupted near the Ft. Boyce Marine Sanctuary, resulting in the devastation of over 2,500 seabirds. F5.2 F5.3

I urge you to address fully the possible impacts of oil and gas leasing on migratory species along the California coast. A 5-Year plan that does not take these factors into consideration is short-sighted and inadequate.

Sincerely,

*Nancy Pelosi*  
NANCY PELOSI  
Member of Congress

HP:jhl/rvt

F6

MARINE MAMMAL COMMISSION  
1225 EYE STREET, N.W.  
WASHINGTON, DC 20004

17 October 1989

Mr. William Bettenberg  
Associate Director  
Offshore Minerals Management Service  
Attn: Branch of Environmental Studies  
U.S. Department of the Interior  
381 Eldon Street, Mail Stop 644  
Herndon, VA 22070

Dear Mr. Bettenberg:

In response to your 16 August 1989 letter, the Marine Mammal Commission, in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed and offers the following comments on the August 1989 "Draft Supplemental Environmental Impact Statement: 5-Year Outer Continental Shelf Oil and Gas Leasing Program, Mid-1987 to Mid-1992." Our comments address issues bearing on the assessment and mitigation of possible impacts associated with the proposed action on marine mammals.

#### General Comments

On 3 July 1987, the Secretary of Interior approved a Final Five-Year OCS Oil and Gas Leasing Program for the period mid-1987 to mid-1992. In response to legal challenges filed by several states and environmental groups, the U.S. Court of Appeals for the District of Columbia ruled that the Final Environmental Impact Statement on the proposed leasing program failed to adequately analyze cumulative effects, including effects of simultaneous development in different regions, on migrating species of birds, marine mammals, and fish. Therefore, to determine if changes in the five-year leasing program might be warranted, the Minerals Management Service has prepared the above referenced Draft Supplemental Environmental Impact Statement (DEIS).

Among other things, the DEIS analyzes possible cumulative impacts of OCS development under the approved and alternative leasing programs on species that may migrate through more than one planning area in the Alaska and Pacific OCS Regions. It also assesses information on cumulative impacts to those species that could occur due to activities and possible oil spills associated with the proposed and alternative leasing actions, and from activities not related to offshore oil and gas development. In this regard, the DEIS concludes, among other things, that: the level of cumulative impact on northern fur seals is likely to be

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high; the level of cumulative impact on Steller sea lions is likely to be moderate; and the level of cumulative impact on other migratory marine mammals, including both endangered and non-endangered species, is likely to range between low and very low.

Analyses in the DSEIS only consider cumulative impacts on migratory species in the Alaska and Pacific Regions. However, migratory species, including marine mammals, also occur in the Gulf of Mexico and the Atlantic OCS Regions. Because the species, population status, and human activities differ in each OCS Region, cumulative impacts to marine mammals and other species also are likely to differ significantly from Region to Region. Based on discussions in the DSEIS, it is not clear whether cumulative effects on migratory species in the Atlantic and Gulf of Mexico Regions will be considered separately in another document or whether the Minerals Management Service has concluded that it is unnecessary to consider cumulative impacts in those Regions. Therefore, if preparation of a separate document to review possible cumulative impacts on migratory marine mammals and other species in the Gulf of Mexico and Atlantic OCS Regions is not planned, we recommend that the DSEIS either be revised to indicate why direct analysis of populations in those areas are unnecessary, or that it be expanded to consider cumulative impacts to marine mammals and other migratory species in those OCS Regions.

With respect to the Alaska and Pacific OCS Regions, the DSEIS considers potential cumulative impacts on some, but not all, migratory marine mammals. It is not clear why certain species have been selected for discussion, while others have been omitted. For example, the DSEIS does not discuss many small cetaceans (e.g., pilot whales, white-sided dolphins, Dall's porpoise, northern right whale dolphins, etc.) or pinnipeds (e.g., walrus and other seals) known to migrate through those Regions. Although the migrations of such species may not be as extensive as those of the great whales (e.g., humpback whales and gray whales), most do migrate between different planning areas in the Alaska and/or the Pacific OCS Regions. Also, effects on many of these other species from frequent incidental take by commercial fishermen, subsistence use, or other human activities increase concern for cumulative impacts due to offshore oil and gas development. Therefore, we recommend that the DSEIS be modified to indicate why the Minerals Management Service considers it unnecessary to review such species in this document, or that it be expanded to assess cumulative effects on other migratory marine mammal populations.

As discussed below, the DSEIS also should be expanded to: a) better reflect the uncertainty and range of possible impacts to marine mammals; and b) identify and describe the steps that will be taken to verify predicted effects and to detect and mitigate possible unforeseen effects on migratory marine mammals and other components of the ecosystem of which they are a part.

F6.1

F6.2

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F6.4

### Specific Comments

Pages I-1 to I-3, Purpose and Need for the Action: This section references a 30 December 1988 finding of the U.S. Court of Appeals for the District of Columbia that the Final Environmental Impact Statement for the Five-Year Leasing Program failed to adequately analyze the cumulative impacts on migratory species. It also notes that "[i]n determining the migratory species to be analyzed in the DSEIS...the analysis initially focused on the general groups of species within the coastal and offshore areas of the Alaska and Pacific Regions." Analyses of cumulative effects in the DSEIS are limited to species occurring in the Alaska and Pacific OCS Regions and we are unable to find any explanation in the DSEIS as to why possible cumulative effects in the Gulf of Mexico and Atlantic Ocean OCS Regions were not explicitly considered.

The nature and extent of offshore oil and gas development and other activities affecting wildlife differ significantly in different OCS Regions. Similarly, the species, population status, and habitat use patterns of marine mammals differ significantly between Regions. For example, West Indian manatees, which migrate along the southeast U.S. coast and which may be affected by OCS related activities, do not occur in either the Pacific or Alaska OCS Regions. Similarly, the abundance and habitat use patterns of endangered right whales differ greatly between the North Pacific and North Atlantic Oceans. Based on discussions in this section of the DSEIS, it is not clear whether or how such differences were considered or if a separate DSEIS is being developed to consider those areas.

Therefore, the Marine Mammal Commission recommends that this section of the DSEIS be expanded to explain why the DSEIS does not include analyses of the possible cumulative impacts on migratory species and populations of marine mammals found in the Atlantic and Gulf of Mexico OCS Regions. If a separate document is being prepared for those areas, it should be so noted. Alternatively, the DSEIS should be expanded to assess possible cumulative impacts on migratory marine mammals in all OCS Regions.

Page II-1 to II-5, Description of the Alternatives: This section describes the proposed final and alternative leasing programs and incorporates by reference the description contained in the 1987 Final Environmental Impact Statement (FEIS). In this regard, the 1987 FEIS includes a description of the objectives and role of the Service's OCS Environmental Studies Program in the leasing process. As indicated below and in the DSEIS, there is considerable uncertainty regarding the nature and extent of possible cumulative impacts on migratory marine mammals due to OCS oil and gas development. Accordingly, the Commission believes that plans for detecting, monitoring, and, as appropriate, mitigating possible unforeseen impacts should be developed and implemented as part of the Environmental Studies Program.

F6.5

F6.6

From the information in the FHS and the DSEIS, it is not clear whether or how such plans will be developed and implemented. Therefore, the Commission recommends that this section of the DSEIS be expanded to identify and describe the role of the Minerals Management Service's OCS Environmental Studies Program in developing and implementing plans for verifying predicted effects and detecting and mitigating unforeseen impacts associated with the proposed final and alternative five-year leasing programs.

F6.7

**Pages III-1 to III-13, Marine Mammals:** This section presents background information on the status, migratory patterns, and prey species of selected endangered and non-endangered migratory marine mammals found in the Alaska and/or Pacific Regions. It does not provide information on all marine mammal species that may be affected by OCS-related development. In addition, some of the migratory species not addressed here or elsewhere in the DSEIS are of concern because of subsistence use by Alaska natives (e.g., walrus, ribbon seals, ringed seals, bearded seals, and spotted seals) or because of incidental taking during commercial fishing activities (e.g., Dall's porpoise, pilot whales, killer whales, white-sided dolphins, northern right whale dolphins, etc.).

F6.8

To assure that the assessment of potential cumulative impacts addresses the species of marine mammals that also are affected by activities other than those related to OCS oil and gas development, the Marine Mammal Commission recommends that this section of the DSEIS, as well as section IV-B (pages IV-16 to IV-39) be expanded to include information on the status and possible cumulative impacts on those species of marine mammals that currently are taken regularly for subsistence purposes by Alaska natives and that are frequently taken incidentally to commercial fishing operations.

**Pages IV-7, Noise and other Disturbances:** The DSEIS summarizes the adverse effects of noise on marine mammals as: (1) auditory discomfort; (2) possible hearing loss; (3) potential masking of communication sounds; (4) behavioral responses resulting in avoidance; and, (5) decreased feeding. Given that the acoustic sense is the primary sensory mode of marine mammals, all of these effects could have a significant impact on marine mammals. Cetaceans may be at particular risk because of their dependence on passive and acoustic signals for navigation, communication, predator avoidance, feeding, etc.

F6.9

While it is clear that humpback whales and gray whales respond to noise produced by offshore oil and gas-related activities, it is not clear whether this response will have significant cumulative impacts on these species. Information cited in the DSEIS is not sufficient to conclude with certainty precisely what effect, if any, OCS-related noise may have on the survival and productivity of humpback whales and gray whales. In addition, exposure to noise may cause pinnipeds to avoid or abandon important feeding and breeding areas. In abandoning such areas, seals may move to sub-optimal habitats or areas already occupied

by other pinnipeds. This, in turn, could increase mortality or decrease reproductive rates due to stress induced by crowding or haulout beaches, limited food, or other factors. Therefore, plans for detecting, monitoring, and as possible mitigating effects of noise on cetacean and pinniped populations should be included as part of Environmental Studies Program efforts to detect, monitor, and mitigate impacts resulting from the proposed action.

**Pages IV-6 to IV-7, Oil Spill Impacts on Fish Resources:** The first paragraph of this section notes that "[o]il spills have been shown to kill adult fish, contaminate fish, reduce the growth of fish, and perhaps decrease fish recruitment." This section does not consider indirect effects to fish stocks due to impacts on invertebrates which provide food supplies for certain fish species. The section should be expanded to do so.

F6.10

In addition, if a spill occurs and oil cannot be removed quickly and effectively from the environment, spilled oil may persist for prolonged periods of time in submerged or intertidal sediments (as seems likely to be the case with the Exxon Valdez spill). The effects of spilled oil, therefore, also could persist over several seasons and affect the productivity of fish stocks and the marine mammals which feed on them. This section of the DSEIS, and the sections discussing species that depend on fish for food, should be expanded to identify and discuss such potential long-term impacts. The uncertainty of possible long-term cumulative impacts illustrates the need to develop and implement long-term monitoring programs as part of the proposed leasing program to detect and, as appropriate, mitigate possible unforeseen effects of OCS development, and to verify predicted effects.

F6.11

**Page IV-25 to IV-26, carryover paragraph:** The last sentence of this paragraph states that "[e]ven if individuals [of certain species of endangered whales] were contacted by spilled oil, impacts may be negligible since Goodale et al. (1981) reported the probable sighting of right whales feeding among the oil spilled by the tanker *Regal Sword* without any apparent adverse impacts." To the best of our knowledge, there is no information on the fate of the animals observed feeding in the area of the oil spill or the possible effects on their physiological, reproductive, or other biological processes in the following days, weeks, months, or years. Therefore, while the cited reference indicates that right whales and perhaps other baleen whales may be unlikely to avoid spilled oil, without information on the subsequent fate of the animals in question, the Commission believes it is unjustified to suggest that the cited observation provides a basis for concluding that spilled oil poses no threat to right whales or other baleen whales. For the reasons stated, this sentence either should: a) be revised to indicate that observations reported by Goodale et al. suggest that right whales and other whales will not avoid spilled oil; b) be expanded to describe information documenting the fate of the affected whales after the referenced feeding bout; or, c) be deleted.

F6.12



**Page IV-26, first complete paragraph:** The last sentence of this paragraph states that right whales are so scarce in the Pacific region that it is unlikely that they would interact with OCS activities. Because of their scarcity, if even a few animals were to be affected by oil spills or OCS oil and gas-related activities, impacts to the remaining population could be substantial. Therefore, to more accurately reflect the risk to this species, something like the following should be added to the end of this sentence:

"However, if even a few animals were killed, injured, or suffered diminished survivorship and/or reproductive potential, impacts to the right whale population could be high."

The uncertain but potentially high level of cumulative impact on North Pacific right whales also should be reflected in the sixth complete paragraph on page IV-26 (i.e., "Conclusion").

**Page IV-29, last paragraph:** The second sentence of this paragraph states that "...oil spills would have to occur during both critical seasons (i.e. in summer in Alaska and winter in southern California) to have greater than a sublethal impact on the minke whales." In addition, the last sentence of the paragraph concludes that "...if an oil spill were to occur and contact the minke whale, the population would probably recover within one generation." There is no explanation as to how these conclusions were reached. They either should be deleted or the rational and supporting documentation for should be provided.

**Page IV-34, fourth complete paragraph:** This one sentence paragraph concludes that cumulative impacts on Steller sea lions are expected to be moderate. Preceding paragraphs in the DSEIS note that, in some areas, the number of Steller sea lions has declined by 50% or more in recent decades due to uncertain causes. They also note that in these areas (i.e., the eastern Aleutian Islands and the western Gulf of Alaska), the level of impact on Steller sea lion populations could be moderate to high. To reflect this uncertainty, the referenced conclusion should be expanded by adding something like the following to the end of the paragraph:

"However, given that some populations of Steller sea lions have declined substantially in recent years due to uncertain causes unrelated to OCS oil and gas development, cumulative impacts on some populations could be high."

**Page IV-38, second paragraph:** This one sentence paragraph concludes that cumulative impacts on harbor seals are expected to be low. Information cited in the DSEIS (i.e., Hoover 1988) indicates that harbor seal numbers have declined by over 50% in recent years in some areas of Alaska (e.g., Kodiak Island

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F6.16

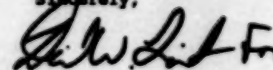
southwest of Kodiak Island) due to uncertain causes. Oil spills, noise, and other OCS-related pollutants could add significant new stresses to harbor seal populations and, as with Steller sea lions, it is possible that the cumulative effects could be moderate to high on those populations already declining. To reflect the range and uncertainty of projected cumulative impacts for harbor seals, something like the following should be added to the end of the referenced paragraph:

"However, for some local populations that are small or have declined substantially in recent years for reasons not related to OCS oil and gas development, cumulative impacts could be moderate to high."

**Pages IV-38 to IV-39, Polar Bears:** The fifth paragraph of this section notes that, although impacts of current development on polar bears are not known and pregnant females may be displaced from preferred denning areas by human disturbance, impacts on polar bears probably would not exceed low levels because bears are distributed sparsely along the Alaska coast. This conclusion may underestimate the level of potential impacts on polar bears because the stated rationale does not consider the reproductive capacity of polar bear or the effects of subsistence hunting. That is, polar bears have a low reproductive potential and the number of animals now taken by subsistence hunters along the Beaufort Sea appears to be at the upper level of what the population can sustain. Therefore, the cumulative impacts of new sources of disturbance or oil spills in addition to the effects of existing human activities could create moderate to high levels of impact. These points and the potential for moderate to high levels of impact should be added to this paragraph and reflected in the paragraph entitled "Conclusion" on the top of page IV-39.

I hope that these comments and recommendations are helpful. If you or your staff have any questions, please call.

Sincerely,



Robert J. Hofman, Ph.D.  
Scientific Program Director

F6.16

F6.17



UNITED STATES DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
Washington, D.C. 20503

Office of the Chief Scientist

November 3, 1989

Ms. Debra Purvis  
Branch of Environmental Evaluation  
Minerals Management Service  
381 Eldon Street  
Norfolk, Virginia 23070

Dear Ms. Purvis:

The National Oceanic and Atmospheric Administration (NOAA) appreciates the opportunity to provide comments on the Department of the Interior, Minerals Management Service (DOI/MMS) Draft Supplemental Environmental Impact Statement for the Five Year Outer Continental Shelf Oil and Gas Leasing Program, 1992-1997. These comments are the result of coordination with the National Marine Fisheries Service (NMFS) Northwest and Alaska Regions. We hope our comments are useful. Please contact me if you have any questions on the comments.

Sincerely,

*David Cottingham*

David Cottingham  
Director  
Ecology and Environmental  
Conservation Office

Enclosure

F7

The Minerals Management Service (MMS) has done a good job of identifying Outer Continental Shelf (OCS) and non-OCS activities along the routes of migratory species in the Pacific and Alaskan Regions in its draft Supplemental Environmental Impact Statement (SEIS) on the Proposed 5-year Outer Continental Shelf Oil and Gas Leasing Program. This is the first time an agency has undertaken a broad review of cumulative impacts from human activities on the marine environment. We commend MMS for their efforts and offer the following comments.

#### General Comments

We believe that a more quantitative assessment of oil and gas leasing activities is needed. Although we recognize the problems associated with deriving these estimates, they become the basis of all potential impacts.

F7.1

We are concerned with the document's conclusions on definitions of cumulative impact levels. The level of cumulative impact is largely dependent on the timing and location of an event and the strength of the population(s) at risk. A moderate impact could be more significant to endangered and threatened species than to non-threatened or endangered. MMS should elaborate on how it determined the various categories of impact.

F7.2

Consideration should be given to the determination of impacts on the Sacramento River winter chinook, recently listed as threatened or endangered, and the possible listing of the Stellar Sea Lion as threatened.

F7.3

F7.4

The MMS may want to reconsider its definition of "migratory" to include species that move among planning areas (i.e. Oregon/Washington and California areas and Gulf of Alaska and Kodiak) but that do not necessarily move between the Pacific and Alaskan Regions. In this regard, species such as king crab and Pacific herring, which will likely migrate among planning areas in the Alaskan Region, should be included in the cumulative impact assessment.

F7.5

F7.6

MMS should also amend the list of migratory species to include halibut, black cod (sablefish), sea turtles and killer whales. Halibut and black cod support valuable fisheries from California to the Bering Sea. Sea turtles, particularly the leatherback turtle, were recently identified in an experimental thresher shark fishery on the Oregon/Washington OCS and occur as far north as the Alaskan OCS. Killer whales are coastal animals that may be vulnerable to impacts of human activities.

F7.7

We are concerned with the analysis of additive or synergistic effects of multiple OCS and non-OCS activities on migratory species. The final SEIS should include analysis of various timing, location and dispersal scenarios and the cumulative

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impacts resulting from these events and an explanation of the approach used to establish levels of impact from existing and future program activities.

The cumulative impacts for all cetaceans are listed as low, with the exception of the harbor porpoise as moderate, based primarily on their coastal habitat. With this rationale, gray whales and killer whales should also be included in this category.

The long term effects of reduced prey should be addressed in the cumulative impacts section of the document. Preliminary conclusions suggest a correlation between prey distribution and feeding patterns and calf production. It is our concern that even small concentrations of oil can kill certain larval stages of important prey organisms for humpback whales and other marine mammals, birds, and fishes.

#### Detailed Comments

#### Fish Resources Description of Migratory Species

##### Pacific Salmon

p.III-22, par.4: Chinook salmon runs in the Pacific Region are not limited to the fall. Summer runs occur June through August, and spring runs occur March through May.

p.III-22, par.6: Is there research to support the statement, "Hatchery production, which is used to heavily supplement weak natural stocks, may reduce the genetic complexity and resistance of natural stocks, as well as contribute to the generation of continued fishing pressure..."?

p.III-23, par.2: "Juvenile" should be eliminated from the first sentence.

- The Puget Sound area does not include Oregon streams. Perhaps the migration routes of salmon from Washington, including Puget Sound and Oregon, should be discussed separately.

- It would be appropriate in this paragraph to address chinook salmon dependency on estuarine habitat. Some chinook stocks spend significant time rearing in estuaries.

##### Steelhead Trout

p.III-24, par.3: Winter-run steelhead migrate to and enter their natal streams in the late fall, winter, and spring (November through May). Summer-run steelhead migrate upstream during the spring, summer, and fall (March through October).

p.III-24, par.4: Is there research to support the statement that Oregon and Washington steelhead abundance has declined from excessive sportfishing pressure (in addition to habitat loss and degradation)? This is a misleading statement since it implies that sportfishing is among the most significant factors contributing to the species' decline.

- The Averett citation on hatchery plantings of steelhead smolts in the Columbia river is outdated. Currently, there are a total of 29 facilities that release steelhead into the Columbia (Oregon Department of Fish and Wildlife - 12; Idaho Department of Fish and Game - 2; Washington Department of Wildlife - 11; and United States Fish and Wildlife Service - 4).

p.III-24, par.5: In the Pacific Region, steelhead smolts enter the ocean primarily between March and June, not merely between March and April.

#### Environmental Consequences

##### Oil Spills - Impacts on the Biological Environment

p.IV-6, par.6: Some specific information (i.e. data and research results) should be provided to describe the lethal and sublethal response to petroleum hydrocarbons by adult fish.

- If studies have concluded that there is no detectable reduction in fishery harvest as a result of open-water spills, then specifics from these studies should be provided.

- Perhaps the sociological implications should be addressed at some point within the environmental consequences section. Recent implications from the Valdez oil spill indicate that even a small batch of oil-contaminated fish can destroy a fishing season.

p.IV-6, par.8: The last sentence of this paragraph should read, "Impacts could be especially severe during smoltification, when the young fish first enter the ocean, and when adults are trying to locate their home drainage before spawning."

p.IV-7, par.1: If a salmon's homing ability is impacted and its return to its natal stream is delayed due to contact with petroleum hydrocarbons, the fish may well be prevented from entering its stream of origin and successfully spawning. NMFS should provide the specifics of the Malins study or other studies pertaining to this.

##### Projects Considered in Cumulative Impacts Assessment

##### Commercial Fisheries

p.IV-9, par.4: With regard to pink salmon landings, it would be helpful to provide the 1979 landings for comparison.

p.IV-9, par.5: References should be provided to support the

statement that the majority of chinook are "landed and presumably caught" in California.  
- Indian tribal catches and treaty fisheries should also be described.

F7.25

#### Cumulative Impacts on Migratory Species

##### Pacific Salmon-Alaskan Region

p.IV-43, par.2: There is an adequate description of the activities that affect freshwater spawning and rearing habitat. However, there is no analysis supporting the statement that "The overall cumulative impact of these activities on the salmon populations, statewide, are estimated to be very low." How was this determination reached?

F7.26

p.IV-43, par.5 and 6: The determination that impacts of oil spills on salmon have been shown to be very low is not well supported. The probability of salmon being contacted by an oil spill for an extended period of time could be moderate or high depending on the timing and location of the spill event. Although salmon are migratory, a large spill or combination of spill events at critical times during the year or life stage could cause significant immediate impacts or persistent sublethal effects for more than one generation.

F7.27

p.IV-43, par.1: Information should be provided on depths of discharges and depths that salmon migrate at different life stages and ages.

F7.28

p.IV-43, par.3: Given all the uncertainties, we question how the impact can be assessed as "very low". Further analysis and explanation is needed to justify this assessment.

F7.29

##### Pacific Salmon-Northwest Region

p.IV-43, par.6: It would be helpful to describe the range of salmon harvests observed in the late 1970's for comparison with future salmon harvest.

F7.30

p.IV-44, par.1: We disagree that significant improvements are unlikely in habitat availability or quality in the next 35 years. For example, the Northwest Power Planning Council's Columbia River Basin Fish and Wildlife Program has set a target of doubling the salmon and steelhead runs of the Columbia River. The Program includes measures to increase fish passage and to enhance and restore habitat. These measures are likely to make a significant contribution to the restoration of Columbia River stocks.

F7.31

p.IV-45, par.5: We disagree with the rationale that only oil spills occurring in areas where salmon producing rivers and

F7.32

sensitive life-history stages are located will affect those stocks. Although adult life stages are not the most sensitive, they can be impacted lethally and sublethally by direct contact.

p.IV-44, par.1: The decline in abundance of populations is expected to be spread primarily over a period of 1-5 years following the oil spill event. We believe there is the potential for the lethal and sublethal effects on the population to be apparent beyond 5 years, such as in year-class and potential fecundity reduction.

F7.33

p.IV-44, par.6: The last sentence should read: "to cause any discernible lethal or long-term impacts that would reduce the abundance of salmon populations."

F7.34

p.IV-47, par.2, and 3: Same comments as p.IV-45, par.5.

F7.35

p.IV-47, par.2, last sentence: It should be noted that in the Pacific Northwest, salmon producing rivers are distributed along most parts of the coastline and into the Puget Sound area. Therefore, virtually any oil spill that contacts the coastline will affect a salmon producing river.

F7.36

p.IV-47, par.5: Same comments as p.IV-45, par.6.

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p.IV-47, par.6: Effects could be much longer term than 5 years.

F7.38

p.IV-48, par.2: Moderate is probably a fair estimate, however, consideration should be given to effects that reach beyond 5 years.

F7.39

- The last sentence should be changed to "...as a result of the combined impacts of oil spills and other causes unrelated to oil/gas development."

F7.40

#### Marine Mammals

##### Description of Migratory Species

###### Harbor Porpoises

p.III-8, par.6: The harbor porpoise meter and feet depth distributions are reversed. It should read 61m (183 ft) and 6m (18 ft).

F7.41

p.III-8, par.7: Gaskin (1984) reported comprehensive surveys from the Atlantic Coast, not the Pacific. No comprehensive surveys have been done in the Pacific.

F7.42

##### Environmental Consequences

###### Noises and Other Disturbances

p.IV-7: For gray and humpback whale studies addressing impacts to marine mammals by airguns and other nonexplosive acoustic

F7.43

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sources, the sample sizes in the experiments are not large enough to determine conclusively that the effect of noise on marine mammals is negligible.

#### Bowhead Whales

p.IV-17, par.5: The Tuktoyaktuk area comprises a small geographic portion of the bowhead's summer range, but it is an area of significant importance since large numbers of animals congregate to feed in this area.

F7.44

p.IV-30, par.4: The final SEIS should discuss the effects of a blowout or oil spill occurring during the 8 week bowhead migration period. Whales migrating through leads tend to congregate, waiting for an open lead. A spill where these whales concentrate could have a catastrophic effect on the population.

F7.45

p.IV-30, par.6: Bowhead calving probably occurs from March to July, not late winter to early spring as stated. Annual calf production varies from 1 to 12 % per year but may average less than 500 newborns, not including losses from natural mortality.

F7.46

#### Gray Whales

p.IV-32, par.7: No citation is given to support the statement that, "...many (as much as 3-5% of the total population) tend to concentrate in the northcentral Bering Sea between St. Lawrence Island and the Bering Strait (in the Norton Basin Planning Area) to feed in the summer." Gray whale experts from the National Marine Fisheries Service, Alaska Fisheries Science Center believe the correct figure to be closer to 30-50% or more at times. No literature sources are listed to support the statement that full recovery of an affected area would occur in 1-3 years.

F7.47

#### Fin and Humpback Whales

p.IV-33, par.8: The assumption that "impacts may be negligible" to individuals because fin and humpbacks have been observed feeding among spilled oil without any apparent adverse impacts is premature. Effects may not be immediately visible.

F7.48

p.IV-30, par.7: The growth rate value has been omitted.

F7.49

p.IV-30, par.9: We disagree with the assumption that the harbor porpoise has become habituated to human-caused disturbances and that the noise from existing vessels has negligible impacts. Harbor porpoise are known to avoid fishing vessel activity and extend their diving times when in the proximity of vessels (Barlow 1988).

F7.50

#### Guadalupe Fur Seal

p.IV-34: We question whether the probability of impacts will be very low. The Guadalupe fur seal population in California is very small and spill modelling for the southern California bight must address the probability of even one oil spill coming ashore

F7.51

at Guadalupe Island and affecting the only breeding population of this species. The island lies only 22 nm south (downcurrent) of the California Channel Islands.

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# United States Department of the Interior

FISH AND WILDLIFE SERVICE  
WASHINGTON, D.C. 20040



F8

In Reply Refer To:  
FWS/EC/WFA

DEC 6 1980

## Memorandum

To: Associate Director - Minerals Management Service

From: Deputy Director

Subject: Comments to Draft Supplemental Environmental Impact Statement for  
5-year Outer Continental Shelf Oil and Gas Leasing Program  
(EC 88/47)

The Fish and Wildlife Service (Service) has reviewed the subject draft Supplemental Environmental Impact Statement (Statement). The following comments are provided for your use and consideration when preparing the final document.

## GENERAL COMMENTS

To more fully comply with provisions of the National Environmental Policy Act, the Statement should provide further discussion of the effects of the proposed program on fish and wildlife resources. Definitions of impact level for the Federally listed threatened or endangered species in Appendix A are not sufficiently comprehensive to allow full evaluation of impacts to fish and wildlife resources. The Service recommends specifying the number of animals or percentage of the population for each impact level in the final Statement.

F8.1

We are concerned about the document's treatment of marine mammals for which the Service is responsible. No information is presented regarding the requirements of various laws or statutes as they relate to protecting whales and polar bears and permitting development. Particularly germane are the requirements of the Marine Mammal Protection Act (MMPA) for "taking," including harassment of small numbers of marine mammals incidental to certain specified activities (50 CFR Part 18.27). The species involved are whales and polar bears and the areas of concern are the Beaufort, Chukchi and Bering Seas.

F8.2

The document provides no treatment of whales. Whales are highly migratory and are an international resource shared with the Soviet Union. Annual distribution of whale herds extends from the southern Bering Sea to the Chukchi and Beaufort Seas in the north. Pacific whale seasonal distribution will overlap with ongoing and future activities in the Chukchi and Beaufort Seas. We recommend a thorough discussion of the relationships between specific proposed activities and potential impacts to whales ranging from individual (vis-a-vis section 101(a)(5) of the MMPA) to population level thresholds. Our Marine Mammals Management Office, 1011 East Tudor Road, Anchorage, Alaska 99503 (907) 706-3452, can assist in preparation of this discussion by supplying appropriate reference material if so requested.

F8.3

Regarding polar bears, life history information indicates that although individuals are distributed sparsely, it appears that at certain times of the year populations may be clumped. Bear densities may be greater during this period resulting in increased vulnerability to adverse human effects such as disturbances, oil spills, etc. Greater detail, with special emphasis upon habitats of importance such as denning, feeding and migratory pathways would facilitate evaluation of the program's effects on polar bears. The statement that native sales are generally found further to the north may be misleading. Sales by their presence tend to exclude other sex and age classes and the exclusion does not necessarily occur on a north to south gradient. The Service Marine Mammals Management Office offers to provide assistance and reprints of topical publications to the authors.

F8.4

Additional data would be necessary to substantiate the conclusions that the impacts from Outer Continental Shelf and non-Outer Continental Shelf activities, including displacement of polar bears from denning habitat, are expected to be low in view of the primary intention of the document to display cumulative impacts. The Service is unaware of information which quantifies availability of various types of denning habitat and the preference of polar bears to the various types of denning habitat types. Publications by Britland (1981), on the effects of crude oil upon polar bears contain appropriate reference material.

F8.5

With respect to treatment of marine and coastal birds, we find the background information and supporting documentation to be generally adequate. The text provides qualitative assessments of potential cumulative impacts to these species, which, with the exception of omissions noted in specific comments below, are generally complete. However, with regard to the way in which cumulative impacts are addressed, we have the following comments.

F8.6

## 1. Quantification of cumulative impacts.

Although not fully described in this document, the method used to quantify cumulative impacts apparently combines impact level with probability of occurrence into a single value. Thus, for a particular event such as an oil spill, when the text documents the potential for very high levels of impact, but the probability

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of occurrence of the event is considered low, the cumulative impact may be rated only as "moderate." A different ranking system, which would provide impact levels and probability levels as separate measurements, would assist readers' efforts to evaluate potential cumulative impacts in a meaningful way. For example, the document could state that for a certain species there is a 10 percent probability that a very high impact will occur, 30 percent probability that at least a high impact will occur, and 90 percent probability that at least a moderate impact will occur. In considering cumulative impacts, it is especially important to clarify the relationship between probability and the time period considered. Although an event or impact may have a low probability of occurring in any single year, it becomes increasingly likely that the event will eventually occur with the passage of time.

The draft Statement also indicates that crude oil would be transported by tanker to the Gulf Coast for refining and only half of the tanker spills would occur in the study area (the Pacific Coast north of the Mexican border). The draft does not discuss potential environmental impacts, including those to federally listed species, outside the study area. A full evaluation of impacts of the proposed program would be facilitated by expanding the study area to include all areas of tankers activity and providing a thorough discussion of oil spill probabilities and impacts within the expanded area.

The following is one example of a potentially high level of impact that is rated as moderate. The document states that for black brant "It is reasonable to assume that a major oil spill will occur, enter some of the lagoons where black brant stage for migration, and contact some of the local goose population while they are on the water. These oiled geese are likely to suffer a high mortality rate..." (p. IV-51, para. 6). "High level of impact could result if an oil spill contacted the (Yukon-Kuskokwim) delta from late June through August when many adults and young occupy low-lying tidal habitats that are vulnerable, or important staging areas along the Beaufort Sea coast from mid to late summer.... Very high impacts could result from oil spill contact with a substantial portion of the habitat occupied by staging geese on the Alaska Peninsula" (p. IV-51, para. 4). However, because the probability of an oil spill contacting the Alaska Peninsula is estimated to be only 15-20 percent (p. IV-51, para. 6), and apparently lower (but not stated) for the Yukon-Kuskokwim delta and the Beaufort Sea coast, the cumulative impact on black brant is rated as only moderate. Similar statements can be found in the evaluations of impacts on emperor geese (p. IV-45-47) and cackling Canada geese (p. IV-48-50), for which cumulative effects are also rated as only moderate.

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V18

## 2. Evaluation of impacts by species groups instead of individual species.

The document lumps most migratory birds species into categories, i.e., other geese, diving ducks, waterfowl, seabirds, and shorebirds. Within each of these groups are numerous species, each with a different geographic range, occupying different habitats, and with different life history requirements. Since impacts on any particular species are averaged over the group as a whole, this tends to diminish the apparent level of impact that may occur to a local or regional population of any single species within the group.

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One example is the impact on the tule goose which potentially could be "...very high as a result of its nesting in a restricted area vulnerable to oil spills from several lease areas and other sources." This level of impact is lumped with several other species to yield an overall ranking of "moderate" cumulative impacts on "other goose species."

FB.11

## 3. Cumulative impacts resulting from onshore support facilities and pipelines.

Readers' understanding of cumulative impacts would be further facilitated if the document addressed the effects of cumulative habitat loss and disturbance factors resulting from onshore support facilities associated with development of Outer Continental Shelf lease areas. In particular, significant impacts can be expected from the major west-to-east pipeline and road infrastructure that would be associated with Chukchi Sea production. These developments would traverse vast areas of previously undisturbed breeding habitats for migratory birds, as well as affecting numerous drainages.

FB.12

## SPECIFIC COMMENTS

### 1. Polar Bear (p. IV-38)

Hypothetical population boundary delineation between Point Lay and Point Barrow should be consistent in the various polar bear sections of the statement (para. 1).

FB.13

Citation(s) (para. 3) discussing the effects of direct oiling of polar bears would be appropriate. The document implies that since polar bears forage for food out of water, few would be contacted by an oil spill. We are unaware of behavioral studies which substantiate this conclusion. Similarly, we are unaware of studies which indicate that population reductions of seals will be low or localized.

FB.14

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We are also unaware of studies which conclusively demonstrate that disturbance will result in very minor and localized displacement of polar bears (para. 4). Baseline studies within the development areas, including consideration of importance of habitat, would be beneficial. General low density of polar bears does not necessarily equate to low probability of displacement. Studies of the long-term effects of oil upon the Arctic environment would also be beneficial.

FB.15

Comparison of legitimate subsistence harvest rates to projected development impacts may be misleading (para. 5). It appears that the Beaufort Sea population is stable, that is, that births are matching deaths. Therefore additional mortality, stress or disturbance may act to affect the population growth.

FB.16

In paragraph 5, the Statement concludes that low densities are automatic to low impacts. Further clarification of inferences to distribution, densities and potential impacts would be beneficial. Disturbance factors associated with noise and human activity are poorly understood. Outer Continental Shelf activities proposed for the future will occur in areas of prime use and importance to polar bears previously devoid of human activity. We do not expect impacts of the proposed activities to be similar to those occurring in other regions of Alaska today.

FB.17

## 2. Threatened or Endangered Birds (p. IV-39)

Biological information for the Arctic and American peregrine falcon and Short-tailed albatross appear to be complete and up-to-date; however, the conclusion that the cumulative impacts to the species will be low may be incorrect. Some listed species, such as the peregrine falcon, have markedly distinct population differences. In such cases the listed status, consultations and recovery planning vary among different populations. The Service considers the Arctic and American peregrine falcons in Alaska to be separate populations. The conclusion (p. IV-40) states that since only a small portion of the entire peregrine falcon population in Alaska and California is likely to be affected, the overall cumulative impacts will be low. However, a large percent of the Alaskan Arctic and American peregrine falcons could be affected. There have been several recoveries of peregrine falcons banded in Alaska along the west coast of British Columbia and the continental United States. Several investigators have documented the migration of peregrine falcons over oceans, thus, the migration of Alaskan peregrines over the Pacific Ocean is probable.

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In light of the evidence that many Alaskan peregrine falcons migrate along the west coast of North America, and probably over the ocean as well, cumulative impacts to the Alaskan populations are more likely to be "moderate" than "minor."

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The Aleutian Canada goose was not discussed in the document because of the assumption that the species makes a non-stop transoceanic migration from its nesting area to its wintering area. While it is probable that such a migration is the norm, it is also likely that during some years these geese put down in the ocean to rest because of bad weather or unfavorable winds. Since a large portion of the population tends to migrate at the same time, impacts of a major oil spill could be significant.

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## 3. Diving Ducks (p. IV-52)

The document recognizes that impacts of oil spills on oldsquaw and king and common eiders could be high because "large proportions of their respective regional populations are concentrated seasonally in vulnerable coastal areas" (p. IV-54, para. 1), in offshore leads during spring migration, and in lagoons during molt and fall migration. The document also correctly states that due to the highly migratory nature of most diving ducks, they can be expected to move through several Outer Continental Shelf planning areas during their annual cycle, thereby exposing their populations to multiple oil spills and other adverse factors associated with oil and gas development (p. IV-56, para. 2). Specific time periods and locations are given for oldsquaw, king and common eider, Steller's eider, black, surf, and white-winged scoters, in which these species could experience high impacts from oil spills (p. IV-56). An oil spill could have a high level of impact on a large portion of a species' population if it occurred at a time and place where the birds were concentrated during molt or migration. Therefore, it would be appropriate to reevaluate the conclusion that cumulative effects on diving ducks would be moderate because "it is highly unlikely that multiple oil spills would contact all of the diving duck habitat along the Alaska and Pacific coastal regions simultaneously" (p. IV-56, para. 2).

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A more complete description of potential impacts to nesting common eiders would be beneficial. The Beaufort and Chukchi Seas populations of this species nest almost exclusively on offshore barrier islands, and thus would be particularly vulnerable to oil spill impacts. The majority of the Beaufort Sea population of common eiders nests on just a few barrier islands between the Canning and Colville Rivers; likewise, the Chukchi Sea birds are concentrated on the barrier islands of Kasoguk Lagoon. An oil spill in either of these areas during June or July would have potentially devastating consequences on regional populations of this species.

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## 4. Waterfowl (p. IV-56)

Major declines in several waterfowl and seabird populations have been documented in recent years. These populations have not yet declined to low enough levels to be considered candidates for listing as threatened or endangered species, but this is not an indication that their populations are stable.

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We are unaware of supporting documentation for the statement that "to date (organic) contaminants have not been implicated in reproductive impairment on (loons and grebes) or any other migratory waterfowl" (para. 3).

FB.23

The document states that although in major oil spills offshore the Alaska and Pacific regions "loons and grebes made up a significant proportion of all birds killed" (para. 4), "implications from previous oil spills show that mortality as a result of an oil spill does not cause population declines which result in changes in distribution or abundance" (para. 5). Citation of information sources for size of spills, number of birds affected, size of populations studied, and duration of studies would be beneficial. In particular, data from the recent Prince William Sound oil spill would be relevant.

FB.24

The statement (end of para. 7) that "impacts are not expected to last more than 1-3 years" may be misleading given that many Outer Continental Shelf activities addressed by this Statement will continue for more than 3 years.

FB.25

Pacific and red-throated loons depend on lagoons and nearshore feeding areas in the Beaufort and Chukchi Seas during the summer breeding period. On the Arctic coastal plain loons nest on freshwater lakes, but they make frequent flights to lagoons and nearshore marine habitats to obtain fish to feed themselves and their young (Bergman et al. 1977; Martin and Hightower 1981). Red-throated loons, which often nest on smaller lakes and ponds than Pacific loons, are especially dependent on offshore foraging flights. Thus, oil spills and other impacts resulting from Outer Continental Shelf activities may have a much greater potential to affect these species than indicated.

FB.26

## 5. Seabirds (p. IV-57)

The third paragraph, which refers to loons and grebes, appears to be out of place here.

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The statement that "all other seabirds (besides the marbled murrelet and elegant tern) are assumed to have stable populations" (para. 2) is contradicted by the documented "50% decline in common murre numbers from the late 1970's to 1986" (top of p. IV-58).

FB.28

We are unaware of supporting documentation for the statement that a seabird population "could recover in 1-3 years" from losses of thousands of birds in a single event (p. IV-58, para. 5). The comparison to natural mortality and population fluctuations may be misleading, since any losses resulting from an oil spill would be in addition to these natural losses.

FB.29

The document states that major declines have occurred in some seabird populations due to gillnetting and other factors; impacts of Outer Continental Shelf activities will add to these impacts. The document notes a sixteen year decline in common murre populations. Further explanation would be helpful for the assumption that mortality from any of these factors "would require 3 to 5 years to recover" (p. IV-58, last para.); hence the assessment that cumulative impacts are expected to be moderate, although the document clearly states that "actual impact to one or more species has the potential to be locally high" (top of p. IV-60).

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## 6. Shorebirds (p. IV-60)

Supporting documentation would be beneficial with regard to the opening statement that "shorebirds show dramatic short- and long-term fluctuations in numbers." The data available for shorebirds nesting on the arctic tundra show remarkable consistency in nesting numbers between years for most species (Tray 1988), despite variability between years in nesting success. Apparent local fluctuations in nesting numbers for some species may be a function of variation in habitat use related to their social systems (opportunistic versus territorial) rather than due to actual changes in population (Pitelka et al. 1974).

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We are unaware of supporting documentation for the statement that "adverse impacts to shorebirds come primarily from loss of winter habitat due to coastal development" (para. 3). The implication that loss of nesting or migratory habitat is insignificant has not, to our knowledge, been documented.

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Although the length of time a bird spends in an area might affect its individual risk of lethal and sublethal exposure to an oil spill, it should not increase a bird's sensitivity to a spill (para. 6). However, when considering population effects, we would expect the greatest impacts to result from an oil spill affecting a major migratory staging area, such as the Copper River delta, where a large proportion of a population may be concentrated in a small area within a short time period.

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The expectation of low cumulative impacts to shorebirds may be unjustified given the assumption that "an oil spill will occur and contact two of the three (listed) sensitive shorebird areas within 1-3 years when shorebirds are present" (p. IV-61, para. 4).

FB.34

#### 7. Pacific Salmon - Alaska Region

An examination of data for the recent Prince William Sound oil spill relative to the statements that "overall impacts from an accidental oil spill would be very low" (p. IV-62, para. 4) and "even given multiple oil spills within the same year, only a small portion of the statewide salmon populations would be contacted" (p. IV-62, para. 5) would be beneficial.

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#### 8. Arctic Cisco

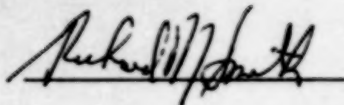
Arctic cisco move through areas of existing and potential Outer Continental Shelf activities in the Beaufort Sea as they migrate to and from the Mackenzie River in Canada. An evaluation of potential cumulative impacts to Arctic cisco, a species of international concern, would be beneficial.

FB.36

#### SUMMARY

Readers' ability to fully evaluate impacts to fish and wildlife resources of the proposed program would be improved if the Statement provided additional information regarding cumulative impacts on federally listed threatened, endangered and migratory species and marine mammals for which the Service is responsible. The Service offers to provide assistance correcting these shortcomings at your request. If you have any questions, please contact David A. Tilton, Division of Endangered Species and Habitat Conservation, Branch of Federal Activities, (703) 358-2183.

FB.37



Attachment

#### REFERENCES

Bergman, R.D., R.L. Howard, K.F. Abraham, and M.W. Weller. 1977. Water-birds and their wetland resources in relation to oil development at Storkersen Point, Alaska. U.S. Fish and Wildlife Service, Resource Publication 129, Washington, D.C. 38 pp.

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Oritsland, N.A., F.R. Engelhardt, F.A. Juck, R.J. Hurst, and P.D. Watts. 1981. Effect of crude oil on polar bears. Environmental Studies No. 24. Northern Affairs Program, Northern Environmental Protection Branch, Indian and Northern Affairs, Canada. 268 pp.

Pitelka, F.A., R.T. Holmes, and S.F. Maclean, Jr. 1974. Ecology and evolution of social organization in arctic sandpipers. *Amer. Zool.*, 14:185-204.

Troy, D.H. 1988. Bird use of the Prudhoe Bay oil field during the 1986 nesting season. Report prepared for Alaska Oil and Gas Association by L&L Alaska Research Associates, Inc., Anchorage 96 pp.



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October 16, 1989

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Dear Ms. Parvis:

Comments on Draft Supplemental Environmental Impact Statement  
Five-Year Outer Continental Shelf Oil and Gas Leasing Program  
Mid 1987 to Mid 1992

We are submitting these comments on behalf of John K. Van De Kamp, Attorney General of the State of California, on the Draft Supplemental Environmental Impact Statement (DSEIS) prepared by the Department of the Interior pursuant to the order of the Court of Appeals for the District of Columbia in the case of Natural Resources Defense Council v. Bredt, 865 F.2d 786 (D.C.Cir. 1989). These comments are submitted pursuant to the Attorney General's independent constitutional, statutory and common law authority to represent the People of the State of California and to protect the resources of the State. We incorporate by reference these comments submitted by the County of Santa Cruz on September 26, 1989.

As a general matter, the DSEIS is fundamentally flawed in its concept of the cumulative impact of the 5-year oil and gas leasing program. The purpose of the cumulative impact analysis is to examine the total effect of a proposed action on the environment. If the proposed action will result in activities occurring for a period of years, then the analysis of the environmental impacts must include the environmental effect of creating those impacts for a period of years. In this instance, the implementation of the 5-year OCS program (Alternative I) will foreseeably lead to OCS exploration, production and development activities that will continue for period of at least 35 years. A proper cumulative impact analysis for the 5-year program should examine the incremental impacts of collectively significant actions over the 35 - 40 year life of the 5-year OCS program.

We understand the scope of the cumulative impacts generated by the 5-year oil and gas leasing program (Alternative I) is broad and that the analysis of the cumulative impacts of such a programmatic decision may be difficult due to information and data gaps and that

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the collection of such data may be difficult or require an extended period of time. However, MMS' NEPA obligations are not satisfied by ignoring these difficulties. The CBQ has promulgated a regulation that addresses such a situation at 40 C.F.R. 1502.22. If uncertainty prevents MMS from fully analyzing the cumulative impacts of the 5-year oil and gas leasing program on migratory species, then MMS must acknowledge such uncertainty and comply with the provisions of 40 C.F.R. 1502.22.<sup>1</sup>

SI.2

The DSEIS examines the impacts of the 1987 OCS program on migratory species encountering more than one oil spill greater than 1000 barrels in one year. (II-4.) It is insufficient to define the cumulative case as a single year in which species encounter two oil spills when analyzing a 5-year program that estimates that 25 oil spills will occur in the Chukchi and Bering Seas over the life of the project and another 13 oil spills will occur in the Southern California planning area. The appropriate analysis would examine the impacts on a species of repeated exposure to oil spills and their aftermath, chronic exposure to noise disturbances, and environmental degradation caused by dumping of formation waters, drilling muds and cuttings. No such analysis is to be found in the DSEIS.

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An example of the DSEIS' failure to examine true cumulative impacts is its assumption that the alteration of migration paths in response to OCS activities is a minor temporary effect (IV-21). The DSEIS does not analyze the impact of migration paths moving further away from the coastal waters for a duration of the program, 35 to 40 years. Nor does the DSEIS consider an impact less severe such as fluctuating migration paths resulting from whales constantly being forced to dodge OCS activities over a long period of time.

SI.5

Other impacts not considered in the DSEIS also occur over time. For instance, the continuous dumping of drilling muds, cuttings and formation waters into the marine environment throughout the Pacific and Alaska regions will affect species whose habitats and migration paths are within the range of OCS drilling and production platforms for a period at least as long as the entire life of the program.

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In short, the analysis in the DSEIS discusses each impact as an

<sup>1</sup> The DSEIS identifies many data gaps and areas of uncertainty and alludes to even more. Tremendous uncertainty exists on the effects of sequential oil spills on waterfowl and seabirds. There are many species whose habits are unknown and upon whom the effects of OCS activities are unknown such as steelhead trout, endangered birds of prey and right and blue whales. Some data gaps are noted at IV - 23, 24, 26, 27, 28, 29, 34, 38, 71, and 73. This is a small fraction of the data gaps noticeable in the DSEIS. 40 C.F.R. 1502.22 must be applied to these data gaps and all other missing information.

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isolated event when it should be presenting the cumulative impacts of the 1987 OCS program. The DSEIS should be analyzing the combined impacts of multiple oil spills, noise and harassment disturbances, toxic elements from drilling muds, cuttings and formation waters and potentially diminished food supplies or contaminants in the food chain for a period of 40 years or more and the effect(s) of combining these impacts with past, present and foreseeable future non-5-year program impacts. For instance, the impact of the Norton Sound OCS mining, combined with the past 5-year program, the Alaska state lease sale program, and commercial gill net fishing on predator bird species may be greater than the oil spill impacts of the 1987 OCS program alone. The timing and combination of these impacts must be analyzed and clearly described and quantified.

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Another fundamental flaw of the DSEIS cumulative impact study is its failure to document and support its conclusions. Almost all of the conclusions and analysis of the cumulative impact of the 5-year OCS program are couched in conditional terms and are in fact hypotheses. For example, the DSEIS states: "Oil spills and noise as a result of previous Federal and State oil and gas lease sales have the potential to affect peregrine falcons...Also peregrines [sic] could be affected by a reduction in prey availability, if a large number of birds in the area are contacted by spilled oil and die. Nesting peregrine falcons could be disturbed by the noise of helicopters...this disturbance could possibly result in abandonment of nesting sites, nestling mortality and reduced reproductive rates." (IV-39.) This hypothetical analysis for two species of endangered peregrine falcon is simply inadequate.

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With respect to marine mammals, no studies are cited to support the conclusions of the DSEIS that 35 years of consistent exposure to oil spills results in a "low impact" on whale species. Instead of relying on all available information and complying with 40 C.F.R. 1501.25, NMS has summarized those studies that conclude that effects of one oil spill on a whale species are sublethal and extrapolate from that to conclude that 35 years of directly encountering fresh oil spills or feeding in habitat recovering from oil spills or other impacts of OCS exploration, production and transportation, in addition to other impact producing activities will also result in low impacts. It is as if NMS were stating that  $1 + 1 = 1$ , or even worse,  $1 + 25 = 1$ . This type of extrapolation must be explained and justified, otherwise it is nothing more than conjecture rendering the DSEIS woefully inadequate.

51.10

#### The Exxon Valdez

The DSEIS fails to include any discussion of information gathered in the wake of the Exxon Valdez oil spill in Prince William Sound. Important new information has already been gathered and is available to NMS. New information is available regarding the number and types

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of birds, pinnipeds and other species killed in the immediate aftermath of the spill. This information is relevant to NMS' assumptions that many species engage in avoidance behavior and are not significantly affected by an oil spill. In addition, NMS has gathered information concerning the impacts of oil spill clean up activities, including noise and vessel traffic which affect some migratory species. Finally, the Exxon Valdez incident confirms that the abilities of industry to contain and clean up an oil spill vary widely from the clean up scenarios assumed in the FEIS. All available information concerning the Exxon Valdez oil spill should be included and considered in the preparation of the SEIS.

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#### Alternatives

The DSEIS fails to analyze a reasonable range of alternatives to the proposed action. The DSEIS examines only three alternatives: 1) the 5-year OCS program as previously adopted by the Secretary in 1987; 2) the 1987 OCS program with the deferral of the St. George Planning area from the current 5-year program and future 5-year programs; and 3) deferral of the all of the lease sales in the Alaska and Pacific regions proposed in the 1987 5-year program (the no-action alternative). The range of alternatives considered in the DSEIS is remarkably limited when considered with the potential for crafting a 5-year program that would stagger leasing among regions or defer leasing in multiple planning areas. Alternatives could and should be crafted that will include more environmentally protective lease stipulations, buffer zones and specific tract deletions, e.g., the Y-K Delta area, to protect coastal birds and marine mammals. Some alternatives should also include the elimination or restriction of certain transportation routes, such as the use of the Unimak Pass through which many endangered whales and other species migrate. Such alternatives would reduce cumulative impacts on migratory species and also obtain oil and gas production. It is important that the Secretary have a full range of alternatives before him when he decides whether to modify or cancel the 1987 5-year oil and gas program.

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#### New Information

There is a two and one-half year gap between the FEIS prepared for the 1987 OCS oil and gas program and the issuance of this DSEIS. Since the preparation of the FEIS, the conditional oil estimates for each of the Pacific region planning areas has changed. This information is important because the conditional oil estimates are a component of the oil spill risk calculations and indicate the distribution of oil in the OCS regions. For instance, in August, 1989, the USGS and NMS estimated the Northern California planning area to contain 322 BOB, while the old estimate of 450 BOB is used in the DSEIS. In addition, the estimates for the Central California planning area have increased from 260 BOB in the DSEIS to 334 BOB in NMS' August, 1989 estimate. The increased quantities of oil will be

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shipped by tanker which in turn increases the risk of an oil spill.<sup>2</sup> Similarly, the number of platforms anticipated in the Northern California region have been increased from 3 in the FEIS to 19. (Draft Environmental Impact Statement for Lease Sale 91, II-4.)

Finally, NMS should acknowledge the new discovery of 400 HMMs of oil at Point Brintyre. AMCO has indicated an intent to develop this field on the Alaskan North Slope which will, again, affect the oil spill risk analysis and transportation scenario. As the DSEIS acknowledges, the risk of oil spills is the single most significant impact produced by the 3-year oil and gas program and therefore, it is important that the Secretary receive the best available information concerning that risk for each planning area and for the cumulative impact of the program as a whole.

#### Failure to Include Analysis of Southern Sea Otter

The Southern Sea Otter has a range encompassing both the Central and Southern California planning areas. Because its range includes these two planning areas and it is a threatened species, the southern sea otter should be included in the cumulative impact analysis or some reason for its exclusion should be articulated. (See I-2.) The sea otter is extremely vulnerable to oil spills and the USFWS estimated that the species could be jeopardized by the existing oil spill risk in the Southern California planning area. (USFWS Formal Endangered Species Consultation to Director of Minerals Management Service Case No. 1-1-86-P-74.) The significant risk posed to the southern sea otter and its range encompassing two planning areas require that the cumulative impacts of the 3-year OCS program on the southern sea otter be analyzed in the DSEIS.

#### Impact Producing Events

NMS has examined a very limited number of impact producing events. The focus of the DSEIS is almost exclusively on oil spills greater than 1000 barrels. The DSEIS fails to thoroughly discuss the effect of continuous dumping of drilling muds and cuttings containing toxic materials into the waters near platforms. The cumulative effect of chronic exposure to toxic materials and contaminated waters on species that pass through, feed or live in such contaminated areas for 40 years or more must be considered. For instance, the DSEIS states that gray whales are bottom feeders and migrate close to shore and near production platforms. (III-2,3.) Yet, there is no discussion of the toxic materials ingested from drilling muds and cuttings and prey in which toxic contaminants have bioaccumulated. (IV-21,21.) Nor is there any discussion of mitigation for the impacts caused by dumping drilling muds, cuttings and formation

<sup>2</sup> DSEIS, Table II.B.1-1 and 2. Estimates given have been risked to allow comparisons between assessments. DSEIS II-2.

waters into the marine environment.

In addition, NMS should consider the cumulative impact of the hundreds of small oil spills, less than 1000 barrels, that will occur as a result of the 1987 OCS program. Conversely, the impacts of multiple large oil spills, such as the Exxon Valdez spill which was 340 times greater than the 1000 barrel spills analyzed by NMS, must be analyzed. We now know that such spills occur in very fragile environments and it is apparent that large numbers of species cannot or do not avoid a very large oil spill. There is also new information from the Valdez experience that it takes a significant period of time to clean large areas and that species' exposure to the spilled oil can be extensive. Moreover, the Exxon Valdez spill has shown that clean up operations are also impact producing events. The DSEIS does not even note the impacts which can be caused by the presence of thousands of people and hundreds of vessels and aircraft in the wake of a major spill. The cumulative impacts of such a large oil spill during the 3-year OCS program, and its clean up, should be considered in the cumulative impact analysis.

#### Impact Level Definitions

NMS has used the same impact level definitions in the DSEIS as it used in the FEIS. (Appendix A.) NMS should state its authority and basis for the definitions it has chosen. There is no citation of authority or explanation for using the same impact descriptions to evaluate cumulative impacts as to describe individual impacts. Nor is there any citation authority for using the same impact level definitions to describe impacts on endangered and threatened species as impacts upon plentiful species. For example, an impact causing a decline in abundance for 1 to 3 years of an endangered species such as the arctic peregrine falcon (of which there are only 80 nesting pairs (DSEIS IV-39.)) may be critical. However, a 3-year decline in harbor seals might not be as significant. (IV-37.) Every time a new impact is imposed upon an endangered species, it is pushed closer to extinction - this must be reflected in the impact level definitions.

#### Conclusion

A review of the DSEIS leads to the conclusion that the document is both fundamentally flawed in its analysis and under-inclusive in the impact producing agents discussed and impacts analyzed. Perhaps most disturbing is the very limited range of alternatives analyzed by the DSEIS. The examination of such a limited range of alternatives indicates that NMS has not attempted to develop alternatives to the 1987 OCS program that would allow oil and gas production and protect migrating species. The Secretary of the Interior will be faced with an important decision to modify or cancel the 1987 OCS program based upon the information provided in the Supplemental Environmental Impact Statement. It is imperative that the DSEIS include a complete analysis of the cumulative effects of the 3-year program based on the best information available and present the Secretary of the Interior with a reasonable range of environmentally and economically sound

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October 16, 1989  
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alternatives for his carefully reasoned decision.

Sincerely,

JOHN E. VAN DE KAMP  
Attorney General

*John E. Van de Kamp*  
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Mary G. Holt  
Deputy Attorneys General



State of California

JANANIE SHARPLESS  
Secretary of  
Environmental Affairs

October 13, 1989

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SUBJECT: Supplemental Environmental Impact Statement for 5-Year Program  
Mid 1987 to Mid 1992

Dear Mr. Purvis:

Thank you for the opportunity to comment on the Draft Supplemental Environmental Impact Statement (EIS) for the 5-Year Outer Continental Shelf (OCS) Oil and Gas Leasing Program Mid-1987 to Mid-1992. As the Governor's OCS Policy Coordinator, my office sent out notices to approximately 275 State agencies, local governments, and other interested parties. We received 6 responses for which we request your full consideration (see Attachment A).

I would suggest that the lack of additional responses is due mainly to the timing of the issuance of this report following so closely behind the initial comments for the new 5-year Program for Fall 1991 to Fall 1996 and the request for comments on President Bush's OCS Task Force Report. State agencies have had to prepare several series of reviews in response to these events. As these notices deal with very similar decisions, the concerns expressed on these individual notices apply to a large extent to all. In particular, California remains deeply concerned about the cumulative impacts of OCS leasing as they may affect migratory species in the Pacific Region. Any improvements suggested for this EIS should be used for the upcoming 5-Year Program as well.

Although the EIS has been prepared in accordance with the court's mandate to address simultaneous interregional development, a calculation showing the extreme unlikelihood of such development in all regions is presented (p. II-2 and 3). While it may be unlikely that development will occur simultaneously in all California, Washington, Oregon, and Alaska planning areas, this calculation misses the point that it is likely that development--which once in place, remains for up to 40 years--will exist in several planning areas and contribute to cumulative impacts on migratory species.

In our past comments on EISs concerning OCS leasing--and specifically in our comments on the current 5-Year Program--we have stated that there are alternatives which while not solely internal to the OCS Leasing Program, need to be analyzed within the context of the Program. Section 1002.14 of the National Environmental Policy Act (NEPA) specifically states that the alternative section "is the heart of the environmental impact statement."

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Alternatives not presented in the supplemental EIS include non-DCS energy sources and how they might provide mitigation to cumulative impacts as well as a more full analysis of phasing of development. NEPA specifically requires in section 1502.14(c) that reasonable alternatives not within the jurisdiction of the lead agency be included. Since NEPA section 1502.14(f) provides that alternatives may substitute for mitigation measures, it is essential that all reasonable alternatives be explored as required under section 1502.14(a).

Additionally, the EIS states (on page II-4) that a deferral of a planning area is assumed to continue through future 5-Year Programs. This assumption should be explained further as it tends to make this alternative less desirable from an overall balancing perspective. It may not be the case that the same area would continue to be deferred based upon future technology or better information concerning the location of recoverable reserves.

A second major concern, and one we noted in the previous EIS for the current 5-Year Program, is the impact level definitions presented in Appendix A. The definitions as presented are identical among fish resources, endangered and threatened species, and nonendangered species. It can be argued that any population decline in an endangered species is unacceptable. A five year impact on an endangered species (defined as "moderate") could translate into a significant loss of a current population which could have major impacts on a gene pool. The definitions also contain a reference to a number of years or a span of generations. Having two ways to measure an impact within a single definition is confusing and provides for an inconsistent methodology in assigning impact levels. This discrepancy should be corrected. In addition, NEPA refers to the need to mitigate adverse environmental impacts. The identification of "low," "moderate," and "high" impacts does not show when an impact is considered significant and requires mitigation.

In one instance (see page IV-42) the EIS notes that impacts are unlikely to disturb the California Least Tern because mitigation is usually required. This statement is not adequate to mitigate the high cumulative impact noted for this species. A lead agency must propose alternatives or mitigations within the EIS and show how the impact will be lessened. Such mitigation can not be left to discretionary future conditions by other agencies which may or may not be imposed.

The oil spill analysis used to determine impacts is not consistently presented. On page IV-65, the EIS states that a total of 21 spills are expected to occur in Southern California over the next 35 years. This conflicts with the information presented on page IV-43, which estimates the number of spills at 12. In addition the spills estimated offshore Central California on page IV-43 is 4, whereas page IV-66 says 3 spills. Also, further explanation should be given as to the determination that additional spills are assumed not to contact the same area twice.

Lastly, NEPA requires that the lead agency identify the preferred alternative(s). It is not clear why Alternative II, which would include

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deferral of areas to reduce the impact to northern fur seals, has not been chosen (page IV-78). As we have suggested, additional alternatives should also be analyzed so that the public may evaluate their comparative merits.

As stated above, full comments submitted to my Agency are included in Attachment A. The concerns raised are summarized briefly below:

Department of Parks and Recreation: The EIS should analyze the cumulative effect of multiple oil spills on a species or critical habitat areas rather than assuming that there would be no recurrence of an oil spill at the same area.

Department of Water Resources: The EIS failed to consider the possible long-term cumulative impacts of the Exxon Valdez magnitude.

State Water Resources Control Board: The Board has no comments.

County of Santa Cruz: The EIS failed to include a complete and objective analysis of all reasonable alternatives, used inadequate definitions for impact levels, contained flawed methodology for impact level assignment, and failed to include several migratory species in the analysis. Data including the location of each species' important feeding grounds, a listing of important prey species, and a listing of probable reasons for migration should be added to the EIS. Oil spill effects on the marine food web have not been presented adequately.

City of Carlsbad: The City is opposed to leasing within 25 miles of the San Diego shoreline. Reasons for this position include detrimental impacts to air quality and quality of life, the need to preserve military operations in the area, and the lack of a national energy policy.

San Diego County: The EIS failed to fully describe the ecology or the status of the California least tern as an endangered species. The impact of oil spills on the least tern population needs to be clarified in the EIS. The County reaffirms its position that no leasing should be allowed in federal waters within 27 miles from shore.

Thank you for the opportunity to review this EIS. We appreciate your efforts to address the cumulative impacts of migratory species in the Pacific regions, and look forward to your response to comments.

Sincerely,

*Janet Sharpless*  
Janet Sharpless  
Secretary of Environmental  
Affairs

Enclosure

cc: Governor's Office

ATTACHMENT A  
FULL TEXT OF LETTERS SUBMITTED

STATE AGENCIES

DEPARTMENT OF PARKS AND RECREATION . . . . . A- 1  
DEPARTMENT OF WATER RESOURCES . . . . . A- 2  
STATE WATER RESOURCES CONTROL BOARD . . . . . A- 3

LOCAL AGENCIES

COUNTY OF SANTA CRUZ . . . . . A- 4  
CITY OF CARLSBAD . . . . . A-12  
SAN DIEGO COUNTY . . . . . A-14

V27

State of California

The Resources Agency of California

S2A

**Memorandum**

Date : September 29, 1969

To : Jeanne Sharpless  
Secretary for Environmental Affairs  
Environmental Affairs Agency  
Office of Offshore Development  
1188 Q Street  
Sacramento, CA 95814 B-4

From : Department of Parks and Recreation  
Resource Protection Division

**RECEIVED**

OCT 03 1969

ENVIRONMENTAL AFFAIRS

Subject: Supplemental Environmental Impact Report Statement for the Department of  
Interiors 5-Year Leasing Program for M&D-1987 to M&D-1992  
SEN 000021910

The California Department of Parks and Recreation is responsible for the management of various preserves and reserves along the California coastline established to protect some of the migratory species identified in the Supplemental EIS. The analysis of impact has been based on the assumption that the additional oil spills resulting from the proposed increased tanker traffic, drilling operations, etc. would impact different areas or islands; that is, that there would be no recurrence of an oil spill at the same area or island. This assumption disregards the court direction to analyze the cumulative effects. This EIS should analyze the cumulative effect of multiple oil spills on a species or a critical habitat areas for a sensitive species. Climatic and geographical conditions, and navigational restrictions contribute to the increased possibilities of spill recurrence.

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*Richard G. Napburn*  
Richard G. Napburn, Chief  
Resource Protection Division

A-1



S2B

State of California

The Resources Agency

## Memorandum

Date : October 3, 1989

To : Amy Glad  
Office of Offshore Development  
Environmental Affairs Agency  
1102 Q Street  
Sacramento, CA 95814

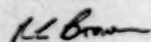
From : Department of Water Resources

Subject: Comments on Report

This is in response to your memo of August 22, 1989, requesting comments on the Supplemental EIS (SEIS) for the five-year outer continental shelf oil and gas leasing program.

The SEIS is generally well-written and technically correct. The major overall comment regarding cumulative impacts involves the failure to consider the possible long-term cumulative impacts of oil spills of the Exxon Valdez magnitude. For example, oil from the Exxon spill may have caused major impacts on salmon spawning in Prince William Sound, Kodiak, the Aleutians, and Cook Inlet. This is especially true for pink and chin salmon which often spawn in the lower reaches of streams affected by spills. Likewise, cetaceans pinnipeds, and marine and coastal birds might be affected through oil-spill caused decreases in their food supply. It will take quite a while to determine if there are any long-term impacts of this spill.

If you have any questions regarding this comment, please let me know.



Randy Brown, Chief  
Environmental Studies Branch  
ATSS 492-7165

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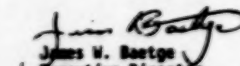
S2C

State of California

## Memorandum

To : Amy Glad  
Environmental Affairs Agency  
1102 Q Street  
Sacramento, CA 95814

Date : SEP 19 1989

  
James W. Baetge  
Executive Director  
From : STATE WATER RESOURCES CONTROL BOARD

Subject: COMMENTS ON THE DEPARTMENT OF INTERIOR'S SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR THE CURRENT OUTER CONTINENTAL SHELF LEASING PROGRAM

In response to your August 23, 1989 memorandum regarding the Supplemental EIS for the Department of Interior's five-year leasing program for mid-1987 to mid-1992, the State Water Resources Control Board has no comment. If you have any comments regarding our response, please telephone Mike Reid, Marine Water Standards Unit, Division of Water Quality at 445-2772.

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SEP 21 1989  
OFFSHORE DEVELOPMENT

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PLANNING DEPARTMENT



COUNTY OF SANTA CRUZ

GOVERNMENTAL CENTER

701 OCEAN STREET SANTA CRUZ, CALIFORNIA 95060

September 26, 1988

Ms. Jonenne Sharpless  
Secretary of Environmental Affairs  
1102 Q Street  
Sacramento, CA 95814

RECEIVED  
SEP 20 1988  
OFFSHORE DEVELOPMENT

Dear Ms. Sharpless:

On September 26, 1988 the Santa Cruz County Board of Supervisors adopted a resolution in support of comments developed by Planning Department staff pertaining to the draft Supplemental Environmental Impact Statement (SEIS) for the 5-Year OCS Oil and Gas Leasing Program: mid-1987 to mid-1992. The comments and supporting resolution, attached for your use, recommends the Department of Interior adopt Alternative III - No Action, which defers the remaining lease sales in the Pacific and Alaska Regions, in order to effectively evaluate the cumulative impacts to migratory species.

The comments provide the basis for the above recommendation. Many deficiencies, omissions and inconsistencies were discovered during our review of the SEIS. These include the omission of a complete and objective analysis of all reasonable alternatives, a discussion of those alternatives which were eliminated from detailed study, the use of inadequate definitions for impacts, a flawed methodology for impact level assignment, and the inadvertent omission of several migratory species from the analysis.

As reflected in our resolution and comments, we are deeply concerned with the potential cumulative impacts of offshore oil and gas exploration and development on migratory species in the Pacific and Alaska Regions. It is imperative that a complete analysis of the issues and alternatives presented in our comments be provided in any forthcoming environmental documents. Therefore, we request that our concerns be incorporated into the Governor's comments to the Minerals Management Service on this matter.

We thank you for your favorable consideration of our comments. Please feel free to contact Donna Bradford or myself at (408) 425-3089 if you have any questions regarding the attached comments.

Sincerely,

Donna Guzman  
Planning Director

Attachments

DB/dh

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ATTACHMENT 1

Comments of Santa Cruz County  
on the Draft Supplemental Environmental Impact Statement  
for the 5-Year OCS Oil and Gas Leasing Program:  
mid-1987 to mid-1992

Santa Cruz County was actively involved in the development of this 5-Year Program and in its subsequent challenge before the U.S. Court of Appeals for the District of Columbia. We appreciate this opportunity to review and provide comments on the draft Supplemental Environmental Impact Statement (SEIS) for the 5-Year Outer Continental Shelf (OCS) Oil and Gas Leasing Program: mid-1987 to mid-1992. We submit the following comments as part of our continuing interest and involvement in the Department of Interior's (DOI) Pacific Region OCS Program.

It is understood that this SEIS analyzes only the cumulative impacts of OCS development on migratory species whose migration routes traverse more than one planning area in the Alaska and Pacific Regions and that the analysis is based on the court's premise that the Secretary of Interior did not previously consider the effects of simultaneous inter-regional development on migratory species in the final EIS.

Our review of the SEIS uncovered several deficiencies, omissions and inconsistencies that should be rectified in the final EIS. These include the omission of a complete and objective analysis of all reasonable alternatives including a brief discussion of those alternatives which were eliminated from detailed study, and the failure of DOI to identify their preferred alternative. Additionally, the definition of impacts and the methodology of impact level assignment is severely flawed. Our final concern deals with the omission of a qualifying and important species of fish and avifauna from the analysis. Our comments which follow provide more detail on these areas of concern.

#### I. Alternatives

As suggested by the court, and consistent with the National Environmental Policy Act (NEPA) requirement to consider alternatives to the proposed action, all reasonable alternatives to simultaneous development that would mitigate any synergistic impacts on migratory species should have been examined. Although, DOI attempts to accomplish the above with Alternative II, their imposition of narrow constraints or assumptions used in the analysis results in the identification of only one migratory species, the Northern fur seal, experiencing an increase in impacts above impact levels from existing activities.

We do not agree with this conclusion reached by DOI. They are only able to arrive at their conclusion because of certain constraints imposed in their

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analysis. These constraints require a species (endangered or not) to concentrate in one vicinity in order for an impact producing factor, such as an oil spill, to create a threshold of impact high enough to cause mortality or a decrease in reproductive success above and beyond the overall population increase of the species throughout its range. For example, any species which tends to widely disperse (no matter how small or endangered the population), and does not happen to seasonally congregate in certain, known areas, would not qualify for consideration in this alternative because no one impact producing factor or agent would contact a significantly large number of individuals in the population as a whole. DOI then uses the boiler plate response, "... when the overall expected level of impacts from all sources is compared with the level of impacts from existing impact producing factors or agents, these levels did not appreciably change." Only the Northern fur seals qualified for analysis in Alternative II because they congregate in the vicinity of the Pribilof Islands during peak passage through Unimak Pass and are extremely susceptible to devastating effects on the population from an oil spill at that location.

In light of the above argument, the SEIS document should have examined other reasonable alternatives to the 5-Year Program to lessen cumulative impacts to migratory species. Other alternatives or mitigation measures could have included: the deletion of certain tracts offered in each planning area which are considered important habitat, such as key feeding, spawning or calving grounds; the establishment of buffer zones adequately large enough to protect particular or "environmentally sensitive" areas important to these migratory species from the specific threat of an oil spill; or an examination of the pace at which leasing would be allowed. Slowing the pace of lease sales within the same or adjacent planning areas would allow for additional time to collect and evaluate new information on biological resource potential, or damage from cumulative impacts.

## II. Definition of "Impacts"

The key and most serious flaw in the SEIS document stems from the designation of generic definitions for impact levels and the lack of any set methodology for impact level assignment. The same definition of the five impact levels (very low, low, moderate, high, very high), is used for all three categories of biological resources (fish, endangered/threatened species, marine mammals/birds). Theoretically, the five impact levels are intended to indicate the degree of intensity or severity of the impact inferred from the analysis. However, as defined in Appendix A, the same unit of measurement for "generation" time is used for all three very different categories of animals. "Generation" time is defined as the number of years accepted as the average period between the birth of the parents and the birth of their offspring, or "X" number of years.

It appears that because a "generation" time is very different for various species, one could conveniently choose either a "generation" time or "X" years in order to ensure an assignment of the lowest impact possible. DOI does not define a set procedure on how to base an assignment of impact level. If, for example, an 8 year-long impact to a species that becomes reproductively mature at age 10 is created, would a "low" level impact

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based on the "less than one generation" criteria be assigned, or would the situation rate the assignment of a "high" level impact based on the impact's 8 year duration?

In addition, one could argue that any population decline in an endangered species is unacceptable under certain circumstances. However, within the definitions of impacts in this document, a population decline resulting in one "generation" duration of effect on an endangered species, would be considered a "low" impact. To carry this argument one step further, one oil spill could cause a three year or one generation impact to the Sacramento River winter-run chinook salmon population (a "moderate" impact), yet would in reality, translate to a loss of a significant portion of this currently, already depressed population and would severely deplete the gene pool of this federally listed "threatened" species.

Throughout section IV.B, DOI uses no consistent methodology for assignment of impact level. In certain instances assignment is based on number of years, while in other cases it's based on "generation" time. In some cases it is unclear as to what criteria was used in the assignment of a particular impact level. In summary, using the defined definitions, and following the method of analysis used in this document, a major oil spill producing "locally" high impacts for a species (even an endangered species), translates into overall "low" regional impacts on the species in the conclusion statements. A more precise set of definitions should be developed taking into account a species' life history pattern and a set procedure for assignment of an impact level should be established and used to more realistically evaluate the effects of lease sale activities on biological resources.

## III. Omitted Migratory Species

Two migratory species have inadvertently been omitted from analysis in the SEIS: Pacific mackerel, a fish resource, and a species of bird known as the Ashy storm petrel.

Pacific mackerel (*Scomber japonicus*), also known as chub mackerel, is an important prey or forage fish for many species of marine mammals, birds, and fish and is also an important commercial fishery resource. Pacific mackerel occur from Banderas Bay, Mexico to southeastern Alaska, including the Gulf of California. However, they are most common from Cape San Lucas, Baja California to Monterey Bay, California and usually occur within 32 km of shore (HBC, 1987). This species tends to migrate north in the summer and south in the winter. Off California, there is also an inshore migration from July-November and an offshore migration from March-May (HBC, 1987). Of particular importance is the fact that there are three distinct spawning stocks in the northeastern Pacific, only one of which occurs in the temperate northeastern Pacific, and which spawns from Eureka, California (but seldom north of Point Conception), to Cape San Lucas, Baja California (HBC, 1987).

The temperate northeastern Pacific stock appears to have suffered a population crash in 1935 and again in the late 1960's and early 1970's. The

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failure of the fishery was apparently due to low population levels resulting from poor recruitment. Although a fishing moratorium was put in effect from 1970 to 1975, it wasn't until the establishment of the 1976 year-class that the population began to recover (WBC, 1987). Strict federal and state commercial fishing regulations remain in effect to this day. With a history of population crashes, and because the eggs, larvae, juveniles, and adults are all pelagic, these fish are highly susceptible to impacts from OCS development.

S201.9

Feeding studies of the Northern fur seal population on San Miguel Island off southern California have identified Pacific mackerel as a prey item in the fur seals diet. Because Northern fur seals are opportunistic feeders, preying on the most available food resource in the area, the importance or predominance of Pacific mackerel in their diet is reflected in the abundance, seasonal availability and distribution of Pacific mackerel (Kajimura, 1982).

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In conclusion, Pacific mackerel are migratory over more than one planning area, a separate spawning stock occurs in a heavily OCS impacted area, a history of population crashes and a pelagic lifestyle makes them highly susceptible to OCS impacts, they are an important fishery resource and an important prey item for other species, especially the Northern fur seal. Therefore, we believe Pacific mackerel meet the requirements for inclusion in the SEIS document.

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Another species which was not discussed in the SEIS is a species of bird known as the Ashy storm petrel (*Oceanodroma homochroa*). The Ashy storm petrel forages in the waters of the California Current, just off the continental shelf. With the exception of one small colony in the Los Coronados Islands of Mexico, the entire known world's population of Ashy storm petrels nests on islands off the California coast, with more than 75% of the population nesting on the Farallon Islands and most of the remainder nesting on the Channel Islands (FWS, 1980). Ashy storm petrels currently number less than 10,000 birds (FWS, 1980), and this entire world population can be found feeding in Monterey Bay over the submarine canyon during the summer and fall (Roberson, 1986). This habit makes them extremely vulnerable to an oil spill off the central California coast. Ashy storm petrels should also have been included in the analysis of this SEIS.

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#### IV. Additional Deficiencies

The format used for the description of each migratory species in Section III. B.-D. is not consistent. Most obviously lacking in the description for most of the species are location of the species' important feeding grounds, a listing of important prey species, and a listing of probable reasons for migration. If this information is not available, it should be so stated.

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The discussion in Section IV.B. should consistently include the effect of oil spills reducing the availability of prey for each species, not just a selected few. The effect of an impact such as an oil spill on marine primary productivity and the food web, and its secondary effect on migra-

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tory species, has been entirely ignored. Some of the highest rates of marine productivity are achieved over the continental shelf, especially in areas of upwelling, and this is where these species will tend to congregate at times, depending upon oceanic and climatic conditions. The effects of an oil spill on prey species and the concentrations of migratory species which feed upon them should be evaluated.

S201.14

The assignment of impact level for species which tend to occur at depths in the water column rather than in the ocean's surface zone, such as Pacific whiting, are also inadequate. This species is not expected to suffer any impact from OCS activities such as oil spills or seismic survey activity, according to DOI, because "... they normally occur at depths well below the water surface (i.e., 90-100 m) and are widely dispersed offshore." However, DOI fails to include in their analysis the effects of oil spills and seismic survey activity to the main food or prey items of the Pacific whiting. Again, this is a serious flaw in the evaluation of lease sale activities upon biotic resources and should be rectified in the final EIS.

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In conclusion, due to the above stated concerns, the County of Santa Cruz does not agree with DOI's conclusion that this 5-Year Program does not increase impacts to migratory species above impact levels from existing activities, with the exception of Northern fur seals. That conclusion has been based upon inadequate resource and life history information of the species involved and demonstrates a lack of understanding about the interdependent nature of the biotic resources which comprise the marine ecosystem. Only through the development of adequate resource information can the effects of lease sale activities on these biotic resources be fully evaluated. The County of Santa Cruz therefore recommends the adoption of alternative III - No Action, deferring further lease sale activities until a thorough analysis of impacts is completed.

S201.16

#### References Cited:

FWS, 1980. Catalog of California Seabird Colonies, U.S. Department of the Interior, Bureau of Land Management, Fish and Wildlife Service, FWS/OBS-80/37. 371 p.

Kajimura, Hiroshi. 1982. Opportunistic feeding of northern fur seals *Callorhinus ursinus* in the eastern North Pacific Ocean and eastern Bering Sea. U.S. Dept. Commerce, NOAA Tech. Rep. NWS 558F-779, 49 p.

NBS, Applied Environmental Sciences. 1987. Ecology of Important Fisheries Species Offshore California, U.S. Department of the Interior, Minerals Management Service, Pacific OCS Region, NWS Contract No. 14-12-0001-30294. OCS Study 86-0093. 251 p.

Roberson, B. 1986. Monterey Birds: Status and Distribution of Birds in Monterey County, California. Monterey Peninsula Audubon Society, Carmel, CA 266 p.



BEFORE THE BOARD OF SUPERVISORS  
OF THE COUNTY OF SANTA CRUZ, STATE OF CALIFORNIA

## RESOLUTION NO. 642-89

On the motion of Supervisor Levy  
duly seconded by Supervisor Mehl  
the following Resolution is adopted:

TITLE: RESOLUTION IN RESPONSE TO DEPARTMENT OF INTERIOR DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT FOR THE 5-YEAR OIL AND GAS LEASING PROGRAM

WHEREAS, the Department of Interior has issued a draft Supplemental Environmental Impact Statement (SEIS) for the 5-Year Oil and Gas Leasing Program: mid-1987 to mid-1992; and

WHEREAS, the SEIS analyzes the cumulative impacts of OCS development on migratory species whose migration routes traverse more than one planning area in the Alaska and Pacific Regions; and

WHEREAS, review of the SEIS has uncovered major deficiencies, omissions and inconsistencies, including the lack of a complete and objective analysis of all reasonable alternatives, an inappropriate definition of impact levels and a severely flawed methodology for impact level assignment, and the omission of two important species from the analysis; and

WHEREAS, offshore oil development threatens our relatively pristine marine environment offshore California which supports these diverse and sensitive migratory species which, through the faulty and deficient analysis in this SEIS, have not been afforded any additional protection from the cumulative impacts of OCS development; and

WHEREAS, additional information concerning biotic resources at risk must be compiled and evaluated to adequately assess the potential for significant adverse environmental impacts from lease sale activities;

NOW, THEREFORE, BE IT RESOLVED AND ORDERED that the Board of Supervisors of the County of Santa Cruz hereby supports the comments developed by County staff finding the SEIS inadequate and requesting the Department of Interior to adopt Alternative III - No Action, which defers the remaining lease sales in the Pacific and Alaska Regions to the 5-Year OCS Oil and Gas Program: mid-1987 to mid-1992; and

BE IT FURTHER RESOLVED AND ORDERED that copies of this resolution and attached comments shall be transmitted by the Clerk of the Board to the Secretary of Environmental Affairs and the Department of Interior prior to their respective September 29 and October 17, 1989 deadlines.

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PASSED AND ADOPTED by the Board of Supervisors of the County of Santa Cruz, State of California, this 28th day of September, 1989, by the following vote:

|          |             |                                     |
|----------|-------------|-------------------------------------|
| AYES:    | SUPERVISORS | Beautz, Levy, Mehl, Keeley & Patton |
| NOES:    | SUPERVISORS | None                                |
| ABSENT:  | SUPERVISORS | None                                |
| ABSTAIN: | SUPERVISORS | None                                |

GARY A. PATTON

Chairperson of the Board of Supervisors

ATTEST: SUSAN M. ROZARIO  
Clerk of the Board

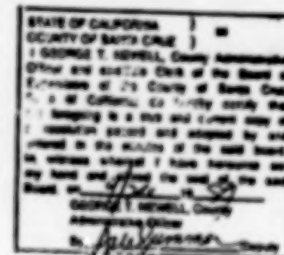
APPROVED AS TO FORM:

*Henry A. Oberhelman*  
County Counsel

DISTRIBUTION: County Counsel  
Planning Department - Resources Section

DR/jh

RESOL



S2E



## City of Carlsbad

Office of the City Council

September 25, 1989

U.S. Department of Interior  
Branch of Environmental Evaluation  
Minerals Management Service  
381 Elden Street  
Mail Stop 644  
Herndon, VA 22070

RECEIVED  
OCT 2 1989  
OFFSHORE DEVELOPMENT

The City of Carlsbad is opposed to gas and oil leasing programs within the 3 to 25 mile nearshore area of San Diego. The gas and oil leases described in the draft Supplemental Environmental Impact Statement, 5-Year Outer Continental Shelf Oil and Gas Leasing Program, would be detrimental to the health, safety and quality of life for human, animal and plant life in the San Diego Region. The five year program should omit all areas of deep water (400 meters or greater) that preclude the use of conventional production technology. We believe that alternative locations and methods need to be more thoroughly investigated and evaluated prior to any further consideration of oil and gas development leases in this area.

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### CONFLICT

The current leasing process maximizes conflict among local governments, the State of California and Federal agencies. We support the separation of oil and gas exploration procedures from the production process to assist in the cooperative efforts of local, State and Federal agencies if we are to achieve consensus on this issue. Separating the procedure from the production should provide the industry, regulators, and local governments with information regarding the quantities and quality of resources in this region. If gas and oil does in fact exist off our coast, then this information could facilitate an appropriate and intelligent strategy for production of these resources with as little negative impact as possible. The current process which allows the industry to explore and produce within the offshore areas with little or no regard for the issues of concern to local governments is totally unsatisfactory.

### AIR QUALITY

The impacts of onshore air emissions should be given high priority before any gas and oil drilling or production leases are considered in the San Diego Region. Southern California has been identified by the Environmental Protection Agency as a "non-attainment" area for achievement of air quality standards. Offshore emissions have severe impacts on the quality of onshore air. It is important that the counterproductive regulatory structure that now exists, be replaced. We support the regulation of both onshore and offshore air emissions by the Environmental Protection Agency.

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### THE MILITARY

Oil and gas production should not take precedence over military operations or near training areas. Special consideration must be given to submarine activities, the amphibious assault training areas, surface ship training areas and aircraft carrier operating and training areas. As you are well aware, San Diego is home to significant numbers of Naval and Marine Forces which operate year-round on land and in the waters near our beaches. Every effort must be made to avoid interruption of the important training grounds to be utilized by our military forces.

### NATIONAL ENERGY POLICY

The Outer Continental Shelf Policy should be part of a national energy policy that sets goals for conservation, renewable energy sources and other potential energy sources. The National Energy Policy should accommodate local concerns and conditions and strive for a coordinated effort.

### QUALITY OF LIFE

Please consider the above mentioned comments prior to final evaluation of the proposed five-year Outer Continental Shelf Oil and Gas Leasing Program for Fall 1991 to Fall 1996. Industries must participate in efforts to reduce adverse impacts on the environment if we are to be successful in the attainment of Federal environmental standards. We do not support any lease sales in the San Diego Region, especially those within the 3 to 25 mile nearshore area. There are high costs associated with preservation of present levels of quality of life and the City of Carlsbad believes these high standards are worth achieving.

Thank you for the opportunity to submit comments on the Outer Continental Shelf Oil and Gas Leasing Program.

Please express our opposition to gas and oil lease sales to the President.

Sincerely,

*Carole A. Lewis*  
CAROLE A. "BOB" LEWIS  
Mayor

c: California Department of Environmental Affairs

ks

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RECEIVED  
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13-10-92

Jananne Sharpless  
Secretary of Environmental Affairs  
1102 Q Street  
Sacramento, CA 95814

Dear Ms. Sharpless:

The County of San Diego is currently in the process of reviewing the draft Supplemental Impact Statement for the 5-year Oil and Gas Leasing Program, 1987 to 1992. The County of San Diego has the following preliminary comments regarding the draft document at this time.

1. The document indicates that impacts within the range of the California least tern are expected to be high. Although the draft Supplemental Impact Statement describes potential impacts from offshore as well as onshore activities which might be felt by the California least tern, it does not fully describe the ecology or the status of the California least tern along its existing range. In order to be complete, the document must be augmented to describe the California least tern's status in terms of its viability within its limited habitat. The California least tern is currently listed as an endangered species by both the U.S. Department of Fish and Wildlife and the California Department of Fish and Game. Facts relating to the bird's endangered status must be included in the Supplemental Environmental Impact Statement. S2F.1
2. The report indicates that like most avian species, California least terns are vulnerable to oil spills, and that an oil spill could contact the breeding locations or colonies during the breeding season when the birds are at their highest risk. The habitat of the California least tern is currently extremely limited. It is difficult to say whether any oil spill within the bird's currently known habitat, whether nesting birds are present or not, would not have a significant impact on the California least tern population as a whole. This needs to be clarified and included in the Supplemental Environmental Impact Statement. S2F.2

A-14

County Administration Center 1600 Pacific Highway • Room 233 San Diego, California 92101 (619) 591-5000

V34

3. The Board of Supervisors has historically taken the position that the nearshore area 3 to 27 miles from shore is of such a sensitive nature that no lease sale activities should be allowed. The draft Supplemental Impact Statement for the 1987 to 1992 Oil and Gas 5-year Lease Program supports that position by its reference to potentially significant impacts to the California least tern, and endangered species. The Board of Supervisors of the County of San Diego would like to reaffirm its position that no lease sale activities should be allowed in the nearshore area 3 to 27 miles from shore. S2F.3

Thank you for the opportunity to provide your office with our preliminary comments on the draft Supplemental Environmental Impact Statement. We will be forwarding these comments to the Department of Interior as we complete our review of the draft Supplement. We will also forward a copy of those complete comments to your office as they are prepared.

Sincerely,

*Susan*  
SUSAN GOLDING  
Chairperson  
Board of Supervisors

A-15

S3

STATE OF CALIFORNIA—THE RESOURCES AGENCY

GEORGE DEURHAM, Governor

## CALIFORNIA COASTAL COMMISSION

451 HOWARD STREET, 4TH FLOOR  
SAN FRANCISCO, CA 94104  
(415) 343-8855

October 16, 1989

Debra Purvis  
Branch of Environmental Evaluation  
Minerals Management Service  
381 Elden Street  
Herndon, VA 22070Re: Comments on Supplemental Environmental Impact Statement for the 5-Year  
Outer Continental Shelf Oil and Gas Leasing Program

Dear Ms. Purvis:

The staff of the California Coastal Commission has reviewed the Supplemental Environmental Impact Statement for the Five-Year Outer Continental Shelf Oil and Gas Leasing Program. We expect that our comments will be addressed in the new Five-Year Program that is currently being developed and in plans for specific lease sales.

The Coastal Commission staff has a number of concerns about the Supplemental Environmental Impact Statement (SEIS), which we believe fails to adequately address the potential cumulative impacts to migratory species from the proposed Five-Year Lease Program. The following is a list of our general concerns:

The analysis of cumulative impacts is inadequate. The impacts from various oil and gas activities in the Alaska and Pacific Regions are considered and the different types of impacts from the Five-Year Lease Program are discussed, but the additive results of all of these effects are not analyzed. The impacts should be added together. For example, the risk of impacts from oil spills plus those from loss of nesting habitat due to human disturbance. Further, the synergistic impacts from more than one effect are not considered. Synergistic impacts result when two or more impacts on a species combine to either increase the effects of one or to create a third impact. The court guidelines specifically state, "describe the OCS and non-OCS activities along those [migratory] routes, and state the synergistic effects of those activities on the migratory species." [emphasis added].

The Exxon Valdez spill is not incorporated in the analysis. The results of this spill should be considered in two ways. First, there is now information on impacts from the Alaskan oil spill that should be included in this analysis. Second, the estimates of spill probabilities in the SEIS are based on historical accident rates. Since the Exxon Valdez spill is now the largest oil spill in North America, it should be included in the data base.

A worst case analysis of the potential cumulative impacts on migratory species from the Five-Year Lease Program development should be performed, in addition to the most likely or median range analysis currently included in the SEIS.

S3.1

S3.2

S3.3

S3.4

S3.5

-2-

There are several problems with the impact level definitions. First, the definitions are not specific enough, and so are not helpful for understanding what the impacts could be. Other EISs have used impact level definitions that include both expected time for recovery and percent of regional and local populations affected. The definitions (and analysis) would be more acceptable if other variables, such as percent of population affected, were included. Second, the impact level definitions for endangered and threatened species are the same as for the other species. For a species that is already at a low level, any decline in the population would constitute a serious impact. Although the duration of the particular impact may last only a few years, the cumulative impact on a declining species or several such impacts could significantly threaten the continued existence of the species. In other words, the risks are greater if the population has already declined substantially. Third, the impact levels depend on a decline in the population. Therefore, sublethal impacts, such as morbidity or relocation of the population, are not given adequate weight.

S3.6

S3.7

S3.8

The bases for applying the impact level definitions to reach conclusions about the levels of impact to each species are not adequately documented. Although a range of impact levels is often discussed, the method used to select a particular level as the overall impact level is not outlined in a systematic manner. A clear description of the deductive reasoning used to achieve each of the conclusions about impact levels to each species should be included. We cannot understand, and therefore cannot agree with, your conclusions until you better document your reasoning.

S3.9

The consideration of alternatives is completely inadequate. The court directed the Department of the Interior (DOI) to "examine alternatives to simultaneous development that would mitigate any synergistic impacts on migratory species." You did not consider alternative actions that could mitigate each of the adverse impacts or the additive or synergistic impacts described. The court further directed the DOI to "set out the pros and cons of various alternatives and explain . . . reasons for adopting whatever course of action he decided upon." There was no discussion of the pros and cons of various alternatives.

S3.10

S3.11

The staff has the following specific comments:

Page numbers

IV-4. It is not reasonable to assume that oil spills would occur within one planning area with uniform frequency over the life of the development. Since the probability of a spill is assumed to be governed by a Poisson distribution, there is no basis for assuming uniform frequency. This assumption results in reduced levels of expected overall impacts, for example:

S3.12

- (P. IV-43) The overall impact to California brown pelicans is found to be moderate partly because it is assumed that more than one oil spill would not occur in the same year or in the same area within 3-5 years.

S3.13

V35

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- (P. IV-68) The overall impacts to pacific region salmon are found to be moderate, in part because individual oil spills in Washington, Oregon, northern California, and central California are assumed to occur no more frequently than intervals of 9-17 years, and therefore overlapping or cumulative impacts on pacific region salmon are not expected.

S3.13

- (Pp. IV-59-60) Cumulative impacts to seabirds are expected to be moderate based in part on the assumption that more than one oil spill would not occur in the same area within 4-6 years.

These findings should be redone without the assumption of uniform frequency of impacts.

IV-30-31 The conclusion of moderate impacts from oil spills to harbor porpoises is based on the assumption that these animals would actively avoid oil and that their food source would not be affected because the fish swim in "patchy distributions." No references are listed for these assumptions. The risk of impacts from oil spills to this species should be given more serious consideration.

S3.14

IV-32-33 The conclusion of a high cumulative impact level on the northern fur seal instead of a very high level should be reassessed. The impacts could be very high from a large volume spill near the Pribilof Islands, from multiple large spills contacting rookery areas during the pupping season, or in the vicinity of Unimak Pass at peak migration within 4-6 years. The reasons for determining that the impacts will only be high are not clear, and appear to be unfounded.

S3.15

IV-34 The population of steller sea lions is declining in several areas, and if oil spills occur in some of these areas, there could be high impacts to this species. The conclusion that impact levels are moderate is not reasonable, because any adverse impacts to an already declining population will make recovery difficult, if not impossible.

S3.16

IV-41 and IV-42 There is no support for the assumption that a large oil spill that contacts California brown pelicans in a sensitive area and during a sensitive season would result in a population decline that lasts only 3-5 years. Similarly, there is no support for the conclusion that an oil spill that contacts the breeding habitat of California least tern would result in a population decline that takes 6-9 years to recover. There is insufficient data on the effects of oil spills on these species to reach a firm conclusion about the number of years that it would take them to recover, and serious impacts to both of these endangered species are likely.

S3.17

IV-59-60 The SEIS includes a finding that overall impacts to seabirds would be moderate. This finding is not reasonable based on the discussion of impacts. The impacts to seabirds from a single

V36

oil spill in any of the planning areas in the Alaska or Pacific Region are expected to be locally high. The cumulative impacts of oil spills and natural environmental disturbances are expected to be significant. The combined impacts of coastal development and gillnetting could be locally high for more than one species. Locally high impacts are significant even if they do not occur over the entire region. There is no support for the assumption that mortality from oil spills would require only 3-5 years for recovery. A study conducted for NWS in 1987, [Nero and Associates Inc., "Seabird Oil Toxicity Study", Feb. 1987, NWS-87-0005.] investigated the impacts of oil spills on seabirds. The study found that a small exposure to oil can result in a long-term depression in breeding success. This effect, in combination with the expected high mortality of seabirds from a large oil spill, means that it is unlikely that seabirds would recover in only 3-5 years.

S3.18

Thank you for your consideration of these comments. If you have questions, please call me or Susan Hatfield at (415) 343-8555.

Sincerely,

*Susan Hansch*

Susan Hansch  
Manager, Energy and Ocean Resources Unit

2905N

S4

STATE OF CALIFORNIA

## STATE LANDS COMMISSION

LEO T. MCCARTHY, Lieutenant Governor  
 GRAY DAVIS, Controller  
 JESSE R. HUFF, Director of Finance

GEORGE DEJUNEAU, Chairman

EXECUTIVE OFFICE  
 1807 - 13th Street  
 Sacramento, California 95814  
 CLAUDE T. DEBRICK  
 Executive Officer

October 17, 1989

Ms. Debra Purvis  
 Branch of Environmental Evaluation  
 Minerals Management Service  
 381 Elden Street  
 (Mail Stop 644)  
 Herndon, VA 22070

Dear Ms. Purvis:

The staff of the State Lands Commission has reviewed the Draft Supplemental Environmental Impact Statement (SEIS) for the Department of the Interior's 5-Year Leasing Program for mid-1987 to mid-1992. We believe the document, in its present form, is inadequate and must be revised in order to be in full compliance with the provisions of the National Environmental Policy Act (NEPA) and the judgement rendered by the Court. In support of these conclusions, we submit the following comments.

GENERAL COMMENTS

The impact analysis is seriously flawed in a number of respects. For the most part it is assumed that there will be no impact if quantitative data documenting impact is unavailable at the present time. For instance, on page IV-31 there are statements indicating there is no data available on the effect of industrial activity and/or OCS activities on bowhead migration or habitat use; these statements are followed by a conclusion of no impact. Given the lack of data, it would be more prudent to conclude that there will be an impact.

54.1

MS. DEBRA PURVIS

-2-

OCTOBER 17, 1989

It is also assumed that animals displaced from one area can easily move to another area. For instance, on page IV-28, it is noted that blue whales may avoid some areas of the Santa Rosa-Cortez Ridge and Tanner-Cortez Banks if there is oil development in the area. This area is a frontal zone between the California current and inshore water masses that is noted for its productivity. The potential effect on food resources available to the whales if this area is made unavailable to them is not analyzed. It is assumed that all areas of the ocean are equal. Critical areas, such as spawning grounds and bottlenecks in migratory routes, are not given added weight in the analysis.

54.2

It is further assumed that rare animals will not be impacted by oil development because the number of encounters will be low. In fact, any encounter causing impact or loss to the population will have major consequences; that is, the degree of impact is not equal for all population sizes. Low probability events do occur and the consequences should be taken seriously. This is particularly true for rare and endangered species.

54.3

Overall, the SEIS underestimates the effect of oil development on migratory species, particularly for the whales. The SEIS assumes that the whales will "adjust" (p. IV-7) or move elsewhere, with no consequence to the population. There is no basis for this assumption.

54.4

SPECIFIC COMMENTS

Page I-2 First full paragraph - The document presently justifies the decision to restrict the document's analysis to only species that migrate through more than one OCS planning area. Even under this criteria, we believe the analysis should include the Southern Sea Otter (California). The California Sea Otter is an threatened species with an areal distribution within two OCS Planning Areas - Central and Southern California. We believe they should have been considered in this document for this reason and also because they could be adversely affected by the potential and cumulative effects of tanker traffic transiting through their range.

54.5

Page IV-3 First full paragraph - Where is the analysis of the environmental consequences of the use of ice-breaking tankers transporting crude oil and how will industry be given the ability to exercise the option of tankers over pipelines?

54.6

V37

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OCTOBER 17, 1989

Second to last paragraph - Is the assumption that the All-American, Pac-Tex and Four Corners (expansion) pipelines will be operational by 1995 still valid? If not, how will this affect this analysis?

54.6

Last paragraph - Will the modification to refineries mentioned in the second sentence be sufficient to eliminate the concern expressed in the first sentence? Will these refineries, as modified, be on-line by 1995 and capable of processing the crude oil previously described?

54.7

Page IV-4

Second paragraph - It is stated that the Exxon Valdez accident resulted in oil contacting 350 miles of shoreline. Alaska Fish and Game (July/August 1989, Vol. 21, No. 4) states on page 21 of the cited document, that by May 19 (eight weeks after the accident) "...oil has now washed up on more than 700 miles of Alaska's shoreline." This figure might have risen since mid-May. They also state that the "...number of dead birds recovered is 14,007 with 38 dead raptors recovered and 690 dead sea otters." These numbers reflect RECOVERED animals, not total mortality. A cumulative analysis of potential impacts from oil development on migratory species must address numbers such as these.

54.8

54.9

Third paragraph - This paragraph seems to indicate that the Exxon Valdez spill was accounted for in prior TAPS spill analyses. The maximum spill studied in that analysis was 140,000 barrels as opposed to the 240,000 barrels actually spilled. Therefore, new analyses are in order.

54.10

Last paragraph - Accident rates for platforms and pipelines are taken from historic rates in the U.S. OCS (Gulf of Mexico and Southern California). Is this valid for Alaska where temperature, weather, sea state, etc. might be different? Would not Alaska be closer in this regard to the North Sea rather than to Southern California or the Gulf of Mexico?

54.11

Page IV-5

Second paragraph, b. Oil Spill Cleanup and Containment - This analysis cannot rely exclusively on a pre-Exxon Valdez analysis of cleanup and containment. Major deficiencies in the existing system became glaringly obvious after March 24, 1989. This section cannot remain as written.

54.12

OCTOBER 17, 1989

Third paragraph, c. Fate of Oil in the Marine Environment - As with the comment above, this analysis is inadequate if it does not take information available after the Valdez accident into account.

54.13

Page IV-11

Paragraph six, d. Coastal Development in California - The population information from 1945-1975 is dated. Most recent estimates place the state's population at 28,000,000+. More important, since this is a cumulative analysis with a scenario covering 35-40 years, is the fact that California's "coastal" (defined as a 50 mile corridor) population is projected to grow as follows:

|                       | 1980 | 1990 | 2020 | 2030 |
|-----------------------|------|------|------|------|
| Population (millions) | 21.2 | 25.9 | 29.5 | 32.5 |
| % of State            | 89.8 | 89.0 | 88.1 | 87.2 |

54.14

(Source: Steven Edwards, p. 229, "Coastal Management," Vol. 17, No. 3, 1989)

The cumulative analysis must take these future changes into account. A 50% increase in the State's coastal population (1980-2030) will only exacerbate the impacts to coastal resources NMS ascribes to our 1975 population.

Page IV-12

Top of page - What is the conclusion here? Is ANWAR part of the cumulative scenario? Please clarify.

54.15

Page IV-14

Although it does not pertain specifically to the analyses required by the Court, the characterization of the activities of the State Lands Commission and activities proposed on State lands is incorrect.

54.16

Page IV-20

The SEIS concludes that bowhead whales will not be affected in leads because oil will accumulate on the downwind side of the leads. However, winds shift and the oil will move around the lead. Furthermore, there is no evidence that the whales will avoid oil and create new leads.

54.17

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PAGE**



OCTOBER 17, 1989

Page IV-22 The fact that oil spills during the winter will be stored in the ice until spring means that effects of oil spills are cumulative. The area effected will be larger so that more than 3-5% of the feeding areas will be affected. | S4.18

Page IV-23 The fact that humpbacks were seen feeding in an oil spill does not mean that there were no effects; the whales may be subject to sublethal effects such as liver and kidney damage. | S4.19

Page IV-24 The Farallon Basin is not necessarily protected because oil spills can travel hundreds of miles. | S4.20

Page IV-27 If belugas respond to ice-breakers, this factor should be taken into consideration in the analysis of the effect of transportation on all whales. Use of ice-breaker barges may not be equivalent to the use of oil tankers or other barges. | S4.21

Page IV-36 The assumption is made that oil spills will be spread evenly over the 35 years under consideration. Probability argues against this assumption. Thus the assumption that oil spills will occur more than 4 years apart and not contact rookeries in the same breeding season is not warranted. | S4.22

Page V-1 Consultation and Coordination - Were all parties to the litigation consulted? If so, at what specific stages of the development of this analysis? | S4.23

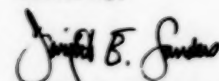
**APPENDIX A**  
**Impact Level Definitions**  
 Page A-1 et seq.

These impact level definitions are categorized according to "Fish Resources," "Endangered and Threatened species," and "Marine Mammals and Birds (Nonendangered Species)"; yet, each definition appears to be the same. In addition, shouldn't there be a level of significance denoted for species that are already listed or candidates? These criteria must take potential "jeopardy" into account. Wouldn't it also be appropriate to have a level of impact that deals with long-term/chronic effects that are persistent, but sublethal? No biologic rationale is offered for the present levels (very high to very low). How were these levels developed? Some explanation/justification is needed. | S4.24

OCTOBER 17, 1989

Thank you for this opportunity to comment. If you have any questions on or desire additional clarification of these comments, please contact me at the above address or by telephone at (916) 322-7827.

Sincerely,



DWIGHT E. SANDERS, Chief  
 Division of Research  
 and Planning

DES:mas

cc: Claire T. Dedrick, Executive Officer

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S5



STATE OF WASHINGTON  
OFFICE OF THE GOVERNOR

OLYMPIA  
98504-0413

BOOTH GARDNER  
GOVERNOR

October 16, 1989

Mr. Barry Williamson, Director  
Minerals Management Service  
U.S. Department of Interior  
Washington, D.C. 20240

Dear Mr. Williamson:

With this letter, I am transmitting the State of Washington's response to Minerals Management Services' (MMS) draft Supplemental Environmental Impact Statement.

The state of Washington has reviewed the draft Supplemental Environmental Impact Statement (SEIS) and provides comments for consideration in the final document. The Minerals Management Service is responding to the United States Court of Appeals ruling requiring additional analysis to address cumulative impacts to migratory species. Our review forces us to conclude that an adequate analysis is not presented in the SEIS. Until good multi-year studies are completed on migratory fishes, birds and mammals, we will not have the necessary understanding to even begin to address possible cumulative interregional impacts that may result from offshore development.

S5.1

We lack good information on spatial and temporal distribution, ecology and critical habitats along the migratory routes of most species offshore Washington.

S5.2

The SEIS does not acknowledge this serious lack of knowledge and the implications on the analysis of cumulative impacts. The court recommended that MMS "identify the various migratory species and the full range of their routes of migration, describe the Outer Continental Shelf and non-Outer Continental Shelf activities along those routes, and state the synergistic effect of those activities on the migratory species." So few data are presented regarding the migratory species moving within and through the Washington/Oregon planning area and other planning areas within the Pacific and Alaska regions, that the conclusions stated in the SEIS are largely factually unsupported.

MMS provides a descriptive narrative of Outer Continental Shelf and non-Outer Continental Shelf activities, but a more quantitative assessment of current and projected levels of oil and gas leasing activities is needed.

S5.3

Mr. Barry Williamson  
Page 2  
October 16, 1989

Additionally, MMS does not consider Canadian Outer Continental Shelf and non-Outer Continental Shelf activities in the impact analysis. MMS should describe current and projected activities in Canadian waters and assess the synergistic effects these might have on migratory species moving between the Alaska and Pacific regions of the U.S. Outer Continental Shelf. Such laws as the International Migratory Bird Treaty Act set a precedent for considering impacts on species that traverse national boundaries. The analysis used to assess levels of impacts (i.e. very low, low, moderate, etc.) on migratory species is inadequate and inconsistently applied. Criteria used to assess levels of impacts are lacking. There is often little supporting evidence used to make conclusions that impacts to a migratory species are "low" or "moderate." No estimates of the percentage of populations that may be affected are used to justify conclusions explicit in the impact definitions (i.e. "low impact -- expected duration of the effects is less than one generation or 1-3 years"). MMS fails to assess if an impact is deemed "moderate" whether this is an acceptable level of risk to a threatened or endangered species.

S5.4

S5.5

S5.6

The list of migratory species should be amended in the final document to include some important species not documented in the SEIS. Marine turtles should be considered in the final document, since catches in the Washington experimental threshold shark fishery (especially of leatherback turtles) and other sightings indicate their presence is more than incidental in waters off Washington state. Killer whales, which are highly vulnerable to oil spill impacts, migrate between the Alaska and Pacific regions and thus should be included. Additional migratory fish species that should be discussed in the final document are halibut, sablefish, Pacific herring, green and white sturgeon and sea-run cutthroat. The bald eagle, a listed species, is also an obvious exclusion, since it has suffered adverse impacts from oil spills in the Pacific and Alaska regions. The snowy plover, a state-listed endangered species recommended for federal listing, should be discussed. Additional state-listed species not covered in the SEIS should also be discussed in the final document.

S5.7

S5.8

S5.9

S5.10

S5.11

S5.12

Impacts on migratory species depend on location and timing of the event and the vulnerability of the population. Any disruption of the feeding areas from oil spills and other exploration/production activities along migratory routes could have severe consequences. "Although it may be appealing simply to compare the relative contributions of contaminants from various sources, this may be misleading because of variations in exposure mode and concentration. Furthermore, biological response may be non-linear. That is to say, the additional contribution of a contaminant, for example, may overwhelm the capacity of an ecosystem to accommodate it." (Boesch and Rabalais, 1987) The SEIS commits this error in its analyses.

S5.13

V40

225



Mr. Barry Williamson  
Page 3  
October 16, 1989

Seabird biologist, Dr. George Hunt, stated in his presentation at the May 1989 Pacific Outer Continental Shelf Information Transfer Meeting in Santa Barbara that a major spill could damage a world population of a particular seabird species. The conclusion reached in the SEIS -- that cumulative impacts to seabirds will be moderate -- treats all seabirds as equally affected and does not analyze seabird populations that are especially at risk (e.g., the marbled murrelet because of its high vulnerability to oil spills).

\$5.13

The SEIS fails to consider critical habitats and species distributions in the Washington/Oregon planning areas and the potential impacts that may result from a spill affecting these areas. For example, the SEIS summarizes little or no data on distribution or migratory routes of diving ducks, peregrine falcons, waterfowl, shorebirds and seabirds. Critical habitats for gray whales and other cetacean species migrating along the Washington coast are not identified in the SEIS. Willapa Bay and Grays Harbor (including the newly established Bowerman Basin National Wildlife Refuge) are critical staging areas in the migration of shorebirds, wintering areas for waterfowl and in- and out-migration of salmonid species. The north coast of Washington between Point Grenville and Cape Flattery supports almost 75% of the state's breeding seabird population, including two of the world's largest rhinoceros auklet colonies.

\$5.14

Though cumulative impacts expected to affect Pacific Region salmonids are considered "moderate" in the SEIS, this is largely because of the perceived threat of overharvesting. The overharvesting element is overemphasized. HHS fails to consider that impacts from an oil spill may extend beyond five years and the life span of the directly affected stocks. Moreover, the final document should provide a more detailed description and analysis of the status of separate stocks of salmonids and expected risk. Treaty fishing rights and tribal fishing activities are inadequately acknowledged and described.

\$5.15

\$5.16

We believe that the SEIS should include discussion on what is currently known of the impacts of the Nestucca spill off Grays Harbor in Washington State and the Exxon Valdez spill relative to the SEIS discussion on environmental consequences of oil spills. A discussion of what is known of resource damages caused by these spills would be especially instructive and worthwhile to include in the final document.

\$5.17

Secondary impacts resulting from damage to fishery resources from an oil spill should be considered, since recreational and commercial fisheries depend heavily on the viability of migratory fish species. Fisheries are a vital component of the Washington State economy. Commercial fishermen from Washington and other states also "migrate" seasonally. An oil spill in the Alaska region has a major impact on fishermen from Washington State, as we've witnessed with the Exxon Valdez spill. Recreational hunting of migratory waterfowl supports local economies and preservation of wetland habitats. Other increasingly economically important "non-consumptive" recreational activities dependent on the viability of migratory species include wildlife observation such as birdwatching and whalewatching.

\$5.18

Mr. Barry Williamson  
Page 4  
October 16, 1989

It was very disappointing to find so many grammatical and typographical errors in the SEIS -- too numerous to list. This certainly makes us question the factual accuracy of the SEIS. Scoping for the SEIS could have reduced this problem.

\$5.19

The following specific technical inaccuracies should be corrected:

- \* p III-5 Harbor porpoise should be described as abundant nearshore to Cape Mendocino; \$5.20
- \* p III-10 Steller sea lion population estimates are too high. Data indicate more drastic population declines than described. The document fails to mention Oregon rookeries at Rogue and Orford reefs; \$5.21
- \* p III-12 Harbor seals -- peak harbor seal populations on land given by season are not true for Washington; \$5.22
- \* p IV-58 The majority of the seabirds affected by the Nestucca spill were murrelets, scoters and grebes. Over 10,000 birds were found, a small percentage of the birds predicted to have been affected. \$5.23

The State of Washington Department of Community Development Office of Archeology and Historic Preservation notes recent changes in federal and state law protecting underwater shipwrecks. Cultural resource issues and compliance with Section 106 of the National Historic Preservation Act need to be addressed.

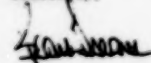
\$5.24

We take exception to the conclusion made under Alternative III - No Action, which states that "the deferral of one or more planning areas in the Alaska and Pacific Regions would not reduce the level of cumulative impacts to the various migratory species with the exception of the northern fur seal." There is not enough evidence to support that conclusion for reasons stated above. The SEIS did not give due consideration to deferral scenarios which may have been recommended by other local, state and federal agencies. Washington State, for example, has sought to protect ecologically important areas by recommending deletion of that acreage north of the 47th parallel and within 12 miles of the Columbia River, Willapa Bay and Grays Harbor estuaries. The state's requested deletions identify the currently known areas that are incompatible with offshore oil and gas exploration and production.

\$5.25

Thank you for the opportunity to comment.

Sincerely,



Booth Gardner  
Governor

V41

# STATE OF ALASKA

## OFFICE OF THE GOVERNOR

### OFFICE OF MANAGEMENT AND BUDGET DIVISION OF GOVERNMENTAL COORDINATION

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STEVE COWPER, GOVERNOR

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#### NORTHERN REGIONAL OFFICE

675 SEVENTH AVENUE  
STATION H  
FAIRBANKS, ALASKA 99701-4500  
PHONE: (907) 455-3554

November 11, 1989

Ms. Carolita Kallaur  
Acting Associate Director  
for Offshore Minerals Management  
Mineral Management Service  
Mail Stop 644  
381 Elden Street  
Herndon, Virginia 22070

Dear Ms. Kallaur:

The state has completed its review of the Draft Supplemental Environmental Impact Statement (SEIS) for the 5-Year Outer Continental Shelf (OCS) Oil and Gas Leasing Program mid-1987 to mid-1992. This draft document supplements the Final Environmental Impact Statement prepared for the 5-year OCS oil and gas leasing schedule, and analyzes the cumulative impacts of OCS development on migratory species whose migration routes transverse more than one planning area in the Alaska and Pacific Regions. The SEIS analysis is based on the premise that the Secretary of Interior did not consider the effects of simultaneous inter-regional development on migratory species. By design, it evaluates both OCS oil and gas activities and non-OCS activities along those migration routes.

It is the state of Alaska's view that the SEIS does not fully consider all of the potential cumulative impacts of OCS oil and gas related activities, and other coastal and offshore activities on fish and wildlife species which migrate between more than one OCS leasing area. Deficiencies include: 1) failure to incorporate and consider significant new information from the March 1989 Exxon Valdez oil spill, 2) failure to consider impacts to all migratory species, 3) underestimation of potential impacts, 4) failure to use recent National Resource Assessment estimates of potential oil and gas resources, and 5) lack of effluent discharge information, 6) failure to use current oil spill estimates. Each of these deficiencies is more fully

S6

56.1

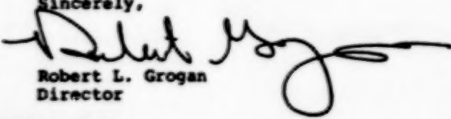
Ms. Carolita Kallaur

- 2 -

November 11, 1989

described in Enclosure 1. In addition, page specific comments on the SEIS are included in Enclosure 2. We appreciate the opportunity to provide you with the State of Alaska's comments on the SEIS for consideration in preparing the final SEIS.

Sincerely,

  
Robert L. Grogan  
Director

cc: John Kats, Governor's Office, D.C.  
Denby Lloyd, Governor's Office, Juneau  
Commissioner Collinsworth, DFG, Juneau  
Commissioner Gorsuch, DNR, Juneau  
Commissioner Kelso, DEC, Juneau

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Enclosure 1  
SEIS DEFICIENCIES

Failure to Incorporate Significant New Information

Even though the SEIS was released in August 1989, it does not include any of the important new information on oil spills from the Exxon Valdez oil spill (EVOS). This information is very important to Outer Continental Shelf (OCS) oil and gas development decisions. The small amount of information the SEIS does contain on the EVOS is incorrect. Important new information from the EVOS which should be included in the analysis is:

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1. Existing oil spill response plans and organizations are ineffective in containing or preventing the spread of a catastrophic oil spill like EVOS. Prior to the EVOS, Alyeska claimed to have one of the largest and best equipped spill organizations in the country. However, when the EVOS occurred it was demonstrated that Alyeska's plan and organization was inadequate to contain or clean up a 100,000 bbl spill in 48 hours as it had promised and planned for.
2. Most existing oil spill containment and cleanup equipment employed by Minerals Management Service (MMS) approved oil spill response and cleanup organizations rely upon the same types of booms, skimmers, incendiary devices, and dispersants as those which proved to be ineffective in containing and clean up the EVOS. In light of this information, oil spill contingency plans should be reevaluated and not relied upon as an effective mitigating measure until major changes in organization, quantity, and types of equipment deployed have been made.
3. Oil from the EVOS spread farther than ever anticipated or planned for. Exxon Valdez oil spread over 30,000 square miles of ocean and contaminated over 1,244 miles of coastline. Resuspended oil continues to threaten new areas over six months after the spill occurred. The Alyeska and U.S. Coast Guard response plans did not anticipate any containment or cleanup efforts outside of Prince William Sound. The SEIS should take into account that a very large spill will move very rapidly under wind and waves and cover much larger areas of coast and marine waters than previously thought.
4. Spilled oil will persist much longer in Alaska's marine environment, and resuspended oil from saturated beaches may effect resources for many months after the initial spill occurred. Resuspension of oil is occurring in Prince William Sound and Knight, Smith, and Disc islands. Large quantities of fresh oil soaked into beaches, streams, and intertidal areas, are a relatively long term threat to the environment.

V43

5. Even optimum summer weather and sea conditions in the protected waters of Prince William Sound often precluded open water oil spill containment and containment operations with booms and skimmers. In fact, Exxon and the U.S. Coast Guard halted all cleanup operations on September 15 because of concerns with human safety in the wind, waves, cold, and darkness of an Alaskan fall and winter. In light of the fact that Exxon and the U.S. Coast Guard did not feel that spilled oil could be cleaned up during late fall or winter, OCS leasing decisions and mitigating measures that have been based on the premise that oil can be contained, burned, dispersed, and cleaned up in the severe summer and winter sea, ice, and temperature conditions of Alaska's OCS planning areas should be reexamined.
6. The impact of oil spill response of vessels, aircraft, and cleanup workers working offshore and on beaches on sensitive fish and wildlife habitats such as eagle nests, seabird rookeries, and marine mammal haulouts could be very severe. The level of disturbance associated with oil spill containment and cleanup on fish and wildlife populations was not considered in the SEIS. Studies are currently under way to quantify this impact, but there is already some evidence to suggest that disturbance from cleanup operations severely reduced nesting by those eagles not killed by the spill. It is also likely that the EVOS CENCLA damage assessment studies may document and quantify many other types of impacts not previously considered by MMS analysts. This information will be very important in assessing cumulative impacts, determining which areas should be deferred from leasing, and in developing truly effective mitigating measures.

Failure to Analyze Impacts to Many Migratory Species

The SEIS was intended to analyze cumulative impacts on migratory species. However, the species discussed include some animals that do not migrate (e.g., harbor seals and harbor porpoise) while several clearly migratory species have been left out. At a minimum, the SEIS should include an analysis of the impacts to Pacific walrus, ringed seal, bearded seal, spotted seal, and ribbon seal. All of these species migrate through several OCS lease areas in the Bering and Chukchi seas on a regular basis. Movements of these species cover greater distances and involve a larger OCS lease area than is the case for harbor seals, Steller sea lions, California sea lions, elephant seals, or harbor porpoise. If species that show only local movements such as harbor seals are included, then species that have similar movement patterns, such as sea otters which are known to be very sensitive to oil spills, should also be addressed.

S6A.2

Other migratory species which migrate through two or more OCS lease areas that should be considered in the SEIS include golden eagles, bald eagles, and king crab. Bald eagles appear to be heavily impacted by the Exxon Valdez oil spill and migrate all along the coast of Alaska as far south as the Pacific Northwest.

#### SEIS Fails to Accurately Characterize Effects of Impacts Certain on Fish and Wildlife Populations

It is the opinion of the Alaska Department of Fish and Game's marine mammal experts that the definitions used for the various categories of impacts (very high to very low) do not accurately characterize the effect on certain fish and wildlife populations. For example, any activity that causes a marine mammal population to decline should be considered to have a high impact. Low or moderate impacts should refer to things such as transient or permanent alterations of distribution, habitat use, behavior, etc. A reduction in abundance of long-lived, K-selected species such as marine mammals is a major problem and should be considered a "high" level of impact. In the case of populations that are declining, such as Steller sea lions, harbor seals, and fur seals, any additional mortality or other impact will hasten the rate of decline. If there is any possibility that OCS activity will impact such species, the impact qualifies as high even by the MMS definitions, and increased levels of OCS activity would have an additional cumulative impact. Similar problems exist for many other species with declining or recovering populations including black brant, cackling Canada geese, white-fronted geese, snow geese, and red king crab.

#### Cumulative Impacts Are Underestimated

State fish and wildlife biologists also believe that the overall cumulative impact assessments under estimate potential population level impacts to some fish and wildlife populations. For example, in light of the EVOS impacts to sea otters and seabirds it can not be concluded that in the event of a major OCS oil spill, there won't be high level of impacts to migratory marine mammal and seabird populations. It is similarly difficult to accept the conclusion that widespread OCS activity would have no more impact on polar bears than if little or no development in polar bear habitat (the "no action" alternative were adopted).

#### Failure to Use Recent NRA Estimates of Oil and Gas Resources

The SEIS uses resource estimates published in the Final EIS, even though the USGS and MMS recently published new, lower resource estimates. In eight of the eleven planning areas in the Alaskan OCS, the new National Resource Assessment conditional resource estimates have been reduced. According to these estimates only the Chukchi and Beaufort planning areas retain a high probability of development. These lower resource estimates will decrease the

potential impacts associated with development of these resources as well as decrease the potential economic benefit. Since a change in the extent of development would directly effect the cumulative impact analysis, the SEIS should include a discussion of these adjustments.

#### Lack of Effluent Discharge Information

Major point source discharges identified in the SEIS include effluent from sewage treatment facilities, industrial facilities, and electric generating facilities. However, the SEIS does not present any new information on quantities or areas of impact. For example, "Municipal wastes and other onshore effluent are discussed by planning area for the Pacific Region in Section IV.B.7. (page IV.B.7.-8), IV.B.8. (pages IV.B.8.-4), IV.B.9. (page IV.B.9-70, IV.B.10. (page IV.B.10-18))." The page numbers refer to the FEIS, and no references are given for the Alaska Region.

Generally, the cumulative effects of drilling effluent discharges are discussed separately under each individual migratory species. The effects of such discharges are concluded to be minor because of the short duration and small number of individuals of the migratory species that would be exposed. Conceptually this conclusion may be valid, however, the analysis of this impact category was not rigorous and presents no new quantitative analysis and only references sections in the FEIS for pertinent data.

#### Failure to Use Current Oil Spill Estimates

With the exception of tanker related oil spill probabilities, the same oil spill rates are used in both the FEIS and the DSEIS, even though new data analyses indicate that OCS platform and pipeline rates are significantly reduced from statistics used in the FEIS (Stewart, 1975 & 1976 and Lanfear & Amstutz, 1983). A decrease in the probability of an oil spill will decrease the potential impacts associated with development. Since this change would effect the cumulative impact analysis, the SEIS should include a discussion of this change.

tg#9103101kfl



## Enclosure 2

Specific Comments on the Draft Supplemental Environmental  
Impact Statement for the 1987-1992 Outer Continental Shelf  
Oil and Gas Leasing Program

- Page 1: The report incorrectly assumes that there will be no difference in impacts to several marine mammal species between the alternative of holding 38 sales in the five years and that of deferring some or all of those sales. This erroneous conclusion results from the inappropriate definitions used for categorizing impacts and underestimation of the potential impacts of various activities associated with outer continental shelf (OCS) exploration and development. 568.1
- Table II.B.1-3: It is the Alaska Department of Fish and Game's (ADF&G) opinion that the overall cumulative impact levels in this table are too low for bowhead whales (should be high), gray whales (should be moderate), beluga whales (should be moderate), harbor seals (should be moderate), and polar bears (should be high). This may also be true for seabirds and waterfowl. Please note that in Enclosure 1 we have recommended that the characterization of the impacts be upgraded. 568.2
- Page III-10, paragraph 1: The Steller sea lion population has declined considerably since the estimate of 231,000 was published in 1984. The Minerals Management Service (MMS) should contact the National Marine Fisheries Service and get recent data to present in the SEIS. 568.3
- Page III-11, last paragraph: There have been no recent estimates of the harbor seal population in the Pacific. The SEIS should indicate what year the data were collected to derive the estimate cited. 568.4
- Page III-12, paragraph 3: There are no data to indicate that the population of harbor seals in the Gulf of Alaska is increasing or that populations in other parts of Alaska are stable. Statements to that effect are very misleading and erroneous. With the exception of the Ketchikan area, all trend count data for Alaskan harbor seals indicate recent declines in numbers. In Prince William Sound (PWS) the decline has been 40 percent from 1984 to 1988. On Tugidak Island the decline has been 82 percent from 1976 to 1984. In Bristol Bay the decline has been 62 percent from 1975 to 1985. With declines of this magnitude, occurring in all the areas that have been surveyed recently, it is improper to assume that numbers have remained stable in areas that have not been looked at. A more appropriate assumption would be that similar declines are occurring in other areas also. 568.5
- Page IV-1, paragraph 7: The cumulative impact analysis assumes implementation of all existing mitigating measures. If that 568.6

assumption is to be made, then MMS should stop eliminating mitigating measures, such as the seasonal drilling stipulation, that have been applied to previous sales. This is particularly important since evaluations of impacts to date are used to project impacts of future activities, and, if impacts have been mitigated by regulation, then projections are only valid if mitigating regulations are continued.

- Page IV-4-5: The figures for the size of the Exxon Valdez oil spill (EVOS), the amount of oil cleaned up, and etc. should be updated. Based upon the state's assessment, 257,000 bbls of oil were spilled; only 32,500 bbls of oil were recovered as of September 15, 1989; 77,100 bbls of oil may have evaporated; and more than 147,400 bbls of oil remain unrecovered in PWS and the Gulf of Alaska. A minimum of 1,244 miles of shoreline were contaminated, not 350 miles of shoreline as the SEIS indicates. In excess of 30,000 square miles of ocean and the resources found there were potentially impacted by the spill. 568.7
- Even though EVOS showed that existing tanker oil spill prevention measures are not completely effective in preventing a catastrophic oil spill, and current response plans, containment and remedial cleanup equipment, and cleanup technology are almost completely ineffective in responding to a catastrophic oil spill, the SEIS does not make any recommendations for changes in oil and gas development decisions or mitigating measures which would reduce the probability of a spill occurring or reduce its impacts. 568.8
- Pages 5-8: The entire section on biological impacts should be redone to incorporate new information from the EVOS which is currently available. 568.9
- Page IV-6: ADF&G's preliminary information from the EVOS shows that salmon do not avoid even heavily oiled intertidal spawning areas. 568.10
- Page IV-7, paragraph 6: This paragraph incorrectly states that marine mammals adjust to human activities and therefore will not be impacted. Observations do show accommodation of certain species to certain activities, but they also show avoidance. There is no reason to believe that seals, sea lions, or whales will tolerate full scale industrial development in their habitats. Some activities at certain levels are sure to alter the distribution or behavior of some species. 568.11
- Page IV-7: The section on noise and disturbance should be revised to consider impacts from noise and disturbance associated with attempts to contain and clean up major oil spills, such as the EVOS. 568.12
- Page IV-8: There is good information on the very significant value of sport fisheries to the Alaskan economy. For example, Jones and Stokes, 1987, estimated that sport fishing provided 393 568.13

234

million dollars to the southcentral Alaska economy in 1986. This information should have been included in the analysis and is available from the Alaska Department of Fish and Game.

Page IV-10: The section on anadromous fish freshwater habitat should have included a discussion of loss of anadromous fish habitat as the result of logging in southeastern Alaska and extensive oiling of intertidal salmon spawning habitat in the EVOS. This information is available from the National Marine Fisheries Service and ADF&G.

Page IV-16: In recognition of the fact that living marine resources do not observe political boundaries, the section on cumulative impacts (pages IV-8 through IV-16) from marine and coastal activities should include an analysis of the impacts of Canadian, Russian, and Mexican activities. Impacts occurring in those jurisdictions could add to cumulative impacts to the species discussed and be important to future NMS decisions.

Page IV-17, paragraph 3: So-called "Minor" deflections could have serious consequences in certain ice conditions such as in the spring lead system.

Page IV-18, last paragraph and page IV-19, paragraph 1: The conclusion of NMS that OCS development in the spring lead system will not have a major impact on bowhead whales is incorrect. In the latest NMFS biological opinion they expressed concern that development could jeopardize the species and called for another consultation before development is approved. The statement implying that the lead system is constantly shifting is also incorrect. The lead may stay in the same location for weeks at a time, and the inner boundary may stay the same for an entire spring season. Similarly ambient noise may be loud, but it can also be extremely quiet in the lead system on calm days. Observations by whalers confirm that whales in the spring lead system are very sensitive to low level sounds.

Page IV-19, paragraph 5: This section fails to consider that if there is an oil spill in or near the Bering Strait, the oil would go across the international dateline into Soviet waters. An oil spill in the Norton Basin or Nopu Basin could have a high impact on fall migrating bowheads because it would likely spread throughout the Bering Straits.

Page IV-19, paragraphs 7 and 8: NMS presents a best case scenario of how oil will contain itself and get out of the way of the whales. The scenario of oil becoming entrapped in a small area under first year ice does not apply to pack ice and does not apply during the summer.

Page IV-20, paragraph 2: The extent of oil spills is not limited by ice in the form of moving pack ice such as occurs in the Navorin Basin.

Page IV-20, paragraph 5: Available data does not indicate that bowheads are scattered on their wintering grounds. To the contrary, the few data available show that whales are clumped in relatively small areas. This data is available from the National Marine Fisheries Service.

Page IV-21, paragraph 1: Bowheads do migrate through some state lease sale areas, and, in any event, noise or spilled oil from state leases could reach whales in adjacent federal waters.

Page IV-28, paragraph 3: It has not been proven that all harmful vapors will dissipate "in a few hours" when crude oil is spilled in ice-covered waters. In the EVOS, vapors remained strong enough to sicken workers weeks after the spill occurred.

Page IV-28, paragraph 7: Noise levels with full scale OCS development will likely be much higher than those now existing. It is certainly true that the full scale spill cleanup operation in PWS greatly increased airborne and waterborne noise above normal ambient levels.

Page IV-28, last paragraph: The conclusion that impacts of additional lease sales would be greater than under the present condition is undoubtedly correct. Impacts will at least be moderate, if the 91 large spills that are projected actually occur. While not all of those spills may occur when belugas are present, experience from EVOS shows that it is unlikely that a major spill would be cleaned up before the whales arrive in an affected area.

Page IV-29, paragraph 1: Belugas commonly swim through areas where access to air is limited, and this situation is not as rare as the paragraph indicates. The statement about exposure to oil killing the "old, young, weakened, or stressed" is inappropriate. Exposure to oil will stress and could possibly kill any animal.

Page IV-33, paragraph 2: Statements about the size of the Steller sea lion population are out of date, and should be revised with more accurate information from DFG.

Page IV-34, paragraphs 2-4: Although some of the statements here are correct, the overall conclusion is wrong. Oil spills and disturbance to haulouts are very likely to impact sea lions, and more leases will increase the likelihood that impacts will be significant. Since the population is greatly reduced throughout the northern Gulf of Alaska and Bering Sea, any impact would likely have long-term consequences. Sea lion haulouts in the PWS, Chugach Islands, the Barren Islands, and Marmot Island were impacted by the EVOS.

Page IV-37, paragraph 6: With the exception of the Ketchikan area, harbor seals are declining in all parts of Alaska that have been surveyed recently.



Page IV-37, paragraph 7: Harbor seals were harvested in Alaska prior to 1972 but there is no indication that harvests were excessive. This is the first time it has been suggested that overharvesting occurred, and the statement should be deleted or referenced. Harvests that occurred in the 1960s are not a factor in the present declines. Populations were large in the mid to late 1970s but have declined since. Effects of harvest should have been seen in the 1970s, nor in the 1980s. Alaska was not a state from 1920 through 1959, so it was not the State of Alaska that was paying bounties on seals during those years.

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Page IV-37, paragraph 8: Since harbor seals are declining in most of Alaska, some existing factor is having a significant impact.

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Page IV-37, paragraph 9: Harbor seal pups are not born in lanugo, they are born with an adult-type coat which they keep for the first year of life.

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Page IV-38, paragraph 5: These statements and conclusions are completely erroneous. Polar bears frequently concentrate along lead systems, in coastal areas, in areas where hunting is favorable, or where carcasses occur. Sightings of as many as 50 bears at a single location have been made. Polar bears range widely which increases the likelihood that many individuals will encounter facilities or spilled oil. They usually forage out of the water but they swim frequently when travelling.

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Page IV-38, paragraph 7: Polar bears will be attracted to facilities in their habitat, and some will have to be killed. In addition, if there is a major spill in polar bear habitat, it is likely that several hundred bears will be affected by the spill and cleanup activities. Laboratory studies have proven that contact with crude oil will kill polar bears.

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Page IV-39, paragraph 1: ADP&C disagrees with the SEIS conclusion. Even using NWS definitions, impacts of OCS activities on polar bears are likely to be moderate with the existing leases, and high if the five-year plan is carried out.

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Page IV-39: Golden eagles are a migratory species which should have been considered in the SEIS. In the Norton Sound area, eagles are often about as numerous as peregrines, and they are protected as well as their nest sites by federal statute. Mercury poisoning and noise disturbance pose as many problems for golden eagles as for peregrines. In section IV-39, under conclusions of impacts to peregrines, "the effect of mercury on peregrine falcons may result in the loss of some or all of the six nesting pairs near the proposed Norton Sound Lease Sale Area, and is expected to result in a moderate level impact on the northwest Alaska coastal arctic peregrine falcon population (ca. 20 to 30 pairs)." The loss of 20 to 30 percent of a nesting population cannot be considered moderate, especially given this is a listed species. Birds contaminated with mercury will be

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potential prey for peregrines, golden eagles, gyrfalcons, bald eagles, rough-legged hawks, and merlins throughout coastal Alaska and elsewhere. Mercury bio-accumulates in body tissues and is highly toxic. Any species contaminated with mercury in the Norton Sound area will contaminate predator or scavenger species elsewhere.

Page IV-58: Prior to the release of the SEIS, information was available that over 30,000 dead birds, which had been killed by the EVOS, had been recovered and that this represented only a small percentage of the number of birds killed which might run into the hundreds of thousands of mortalities. The significance of this level of mortality should be discussed in the SEIS.

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**State of South Carolina**  
**Office of the Governor**

CARROLL A. CHAPPELL, JR.  
GOVERNOR

OFFICE OF EXECUTIVE  
POLICY AND PROGRAMS

September 13, 1989

Ms. Debra Purvis  
Branch of Environmental Evaluation  
Minerals Management Service  
United States Department of the Interior  
381 Elden Street  
Herndon, Virginia 22070

Re: Supplemental Environmental Impact Statement  
Five Year Outer Continental Shelf Oil and Gas Leasing Program  
Coastal Counties of Alaska, California, Oregon and Washington

Dear Ms. Purvis:

Thank you for referring several copies of the above referenced document to this office for review. However, since the State of South Carolina is not included in the area of potential impact, no review will be conducted by the South Carolina Project Notification and Review System.

If I may answer any questions, please do not hesitate to contact me at (803) 734-0493.

Sincerely,

*[Signature]*  
G. E. Crowder

State Single Point of Contact  
Intergovernmental Review

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STATE OF MISSISSIPPI

Cecil Brown, Executive Director  
Department of Finance and  
Administration

Royal Walker, Jr., Director  
Office of Policy Development  
and New Initiatives

**MEMORANDUM**

TO: US Department of the Interior  
Minerals Management Service  
381 Elden Street  
Herndon, VA 22070

DATE: September 22, 1989

FROM: STATE CLEARINGHOUSE FOR FEDERAL PROGRAMS

SUBJECT: REVIEW COMMENTS  
Activity: Draft of Supplemental Environmental Impact Statement - 5-year  
Continental Shelf Oil and Gas Leasing Program - Mid 1987 to Mid 1992. Area of  
Potential Impact: Offshore Marine Environment and Coastal Counties of Alaska,  
California, Oregon and Washington.  
State Application Identifier Number: MS890831-007

Location:

Contact: Debra Purvis

The State Clearinghouse, in cooperation with state agencies interested or possibly affected, has completed the review process for the activity described above.

**INTERGOVERNMENTAL REVIEW PROCESS COMPLIANCE:**

- ( ) We are enclosing the comments received from the state agencies for your consideration and appropriate action. The remaining agencies involved in the review did not have comments or recommendations to offer at this time. A copy of this letter is to be attached to the application as evidence of compliance with Executive Order 12372 review requirements.
- ( ) Conditional clearance pending Archives and History's approval.
- (x) None of the state agencies involved in the review had comments or recommendations to offer at this time. This concludes the State Clearinghouse review, and we encourage appropriate action as soon as possible. A copy of this letter is to be attached to the application as evidence of compliance with Executive Order 12372 review requirements.
- ( ) The review of this activity is being extended for a period not to exceed 80 days from the receipt of notification to allow adequate time for review.

**COASTAL PROGRAM COMPLIANCE (Coastal area activities only):**

- ( ) The activity has been reviewed and complies with the Mississippi Coastal Program. A consistency certification is to be issued by the Bureau of Marine Resources in accordance with the Coastal Zone Management Act.
- ( ) The activity has been reviewed and does not comply with the Mississippi Coastal Program.

cc: Funding Agency (As requested by applicant)

421 West Pascagoula Street - Jackson, Mississippi 39203 - (601) 950-4282  
"An Equal Opportunity Employer M/F/H"

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**MARYLAND  
OFFICE OF PLANNING**

301 W. PRESTON STREET  
BALTIMORE, MARYLAND 21201-2800

WILLIAM DONALD SCHAEFER  
GOVERNOR

DONALD BREITNER  
ACTING DIRECTOR

89

August 23, 1989

Mr. Robert Purvis  
Branch of Environmental Evaluation  
Minerals Management Service  
361 Eldon Street  
Herndon, Va. 22070

Re: SAI (MDS90022-0606, 5 Year Outer  
Continental Shelf Oil and Gas Leasing  
Program (Coastal Counties: Alaska,  
California, Oregon and Washington)

Dear Mr. Purvis:

We have received the copies of the supplemental environmental impact statement for the referenced project. Since the statement identifies the area of potential impact as being on the west coast, we are transmitting copies of the statement to other state agencies for their information.

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However, we do appreciate your cooperation with the intergovernmental review process.

Sincerely,

*[Signature]*

Harry J. Abrams  
Chief, Maryland State Clearinghouse  
for Intergovernmental Assistance

WJA:SDrac1

Enclosure

REVIEW COORDINATOR

Shirley Hoshaw - HSCB  
James Tait - HSCB (2 copies)  
Rat Brown - HSCB (2 copies)  
Clyde Pyers - HSCB  
Roland English - OP

TELEPHONE 301-252-4000  
TTY FOR DEAF 301-252-1000

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**Pennsylvania Intergovernmental Council**

P. O. BOX 11000 • HARRISBURG, PA. 17105-1000 • (717) 782-0200

August 22, 1989

Branch of Environmental Evaluation (Mail Stop 646)  
Minerals Management Service  
361 Eldon Street  
Herndon, Virginia 22070

Dear Sir or Madam:

Pennsylvania's Single Point of Contact under Executive Order 12372 has received the Supplemental Environmental Impact Statement for the 5-Year Continental Shelf Oil and Gas Leasing Program. Since this supplemental Environmental Impact Statement does not have a direct impact upon Pennsylvania, we have not entered it into Pennsylvania's Intergovernmental Review Process. Thank you, however, for notifying us of this project.

510.1

Should you have any questions, feel free to contact us.

Sincerely,

*Laine A. Hattelbridge*

Mr. Laine A. Hattelbridge  
Project Coordinator  
Intergovernmental Review Process

*Strengthening Intergovernmental Relations and Public Decision-making in Pennsylvania*

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**Executive Department**

186 COTTAGE STREET NE, SALEM, OREGON 97310

811

October 18, 1989

Diana Purvis  
Branch of Environmental Evaluation (Bill Stop 644)  
301 Eldon Street  
Bremen, VA 22809

Subject: 5-Year Outer Continental Shelf  
Oil and Gas Leasing Program  
FWS SCH99021-010-4

Thank you for submitting the subject Supplemental Environmental  
Impact Statement for State of Oregon review and comment.

The Counties of Coos and Curry, the State Historic Preservation  
Office, and the Departments of Fish and Wildlife, and Environmental  
Quality have submitted the attached comments for your consideration.

Sincerely,

ENVIRONMENTAL RELATIONS DIVISION

*Dolores Streeter*

Dolores Streeter  
Clearinghouse Coordinator

30677

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COOS COUNTY COURTHOUSE  
Coquille, Oregon 97423  
phone: (503) 396-3121  
Ext. 224, 225

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*County of Coos*

BOARD OF COMMISSIONERS

Gordon Ross  
Doc Stevenson  
Jack L. Beebe, Sr.

October 4, 1989

Dolores Streeter  
State Clearinghouse  
186 Cottage St. NE  
Salem, Oregon 97310

Dear Dolores:

During the regularly scheduled Board meeting of October 4, 1989 the Coos  
County Board of Commissioners replied to the Local Clearinghouse Review by  
the U.S. Department of the Interior, Coastal Counties for the 5-year Outer  
Continental Shelf Oil and Gas Leasing Program.

The Board was unable to receive information from staff and other sources  
such as OCMA, due to lack of adequate copies of the amendment. There-  
fore, felt that there was a lack of adequate information to make an informed  
decision and do not wish to comment at this time.

Sincerely,

BOARD OF COMMISSIONERS

*Jack L. Beebe*  
Commissioner

511A.1



CURRY COUNTY OREGON BOARD OF COMMISSIONERS

Randy McVay

T.V. Shiner

David F. Wenzel



MEM 700

CURRY COUNTY, OREGON SEP 1989

MEM 700-7001

Check back on the Curry Coast

811B

July 28, 1989

The Honorable Manuel Lujan  
Department of the Interior  
1800 "C" Street, N. W.  
Washington D. C. 20240

RE: Oil and Gas Lease Sale #132

Dear Secretary Lujan:

Curry County, located on the southern Oregon coast, is blessed with what many believe is the most beautiful coastline in America. In large part because of this we have had strong growth in the tourism and retirement-related industries. In addition to these activities, fisheries have always been a mainstay of the Curry County economy.

For these reasons the people of Curry County are deeply concerned that the exploration for and development of offshore oil and gas and other mineral deposits threatens our way of life. Recently we appointed a citizen task force to evaluate the impacts of oil and gas development on Curry County and, based on this analysis, to recommend a course of action to the Board of Commissioners.

This task force was composed of individuals retired from the oil and gas industry, a port manager, a chamber of commerce manager, fishermen, land developers along with other concerned people. In short, a broad spectrum of people involved in the life and future of Curry County.

One recommendation of the task force was that Curry County oppose oil and gas development in the Oregon territorial sea and request all action on federal lease sale #132 stop until specific studies are completed to the standards set forth by the states of Oregon and Washington.

In addition Curry County is drafting an ordinance amending the comprehensive land use plan to prohibit the placement of offshore support facilities for marine mineral development without an affirmative vote of the people. In brief the people of Curry County want to insure that their voice is heard when the future of Curry's offshore resources is determined.

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COURT DE 16th June 21st, 1989

In the Board of County Commissioners  
In and For the County of Curry

In the Matter of a Resolution in  
Support of the Oregon Ocean  
Resources Task Force Position  
Regarding Oil and Gas Exploration  
and Development

Resolution

Whereas the Curry County Marine Resources Task Force (COMRTF) has completed the tasks that the Board of Curry County Commissioners (Board) requested that it carry out with respect to possible future development of offshore mineral resources in Curry County; and

Whereas the results of a COMRTF questionnaire and of public meetings indicate that the residents of Curry County are opposed to the development of potential oil and gas resources off the Curry County coastline; and

Whereas the Board is cognizant of the environmental threats posed by offshore oil and gas development; and

Whereas the Board is concerned about the potential conflict of oil and gas development with the backbone of the region's economic strategy - tourism;

Now, Therefore, It is Hereby Resolved that the Board of Curry County Commissioners adopts and supports the Oregon Ocean Resources Task Force's position of excluding offshore oil and gas exploration and development in the Oregon territorial sea and to oppose the sale of federal lease sale #131 until specific environmental studies are completed to the standards set forth by the states of Oregon and Washington.

DATED this 26th day of June, 1989.

Board of County Commissioners

*[Signature]*  
T. J. Shiner  
David F. Garroch

## Alaska Oil and Gas Association

121 W. Fireweed Lane, Suite 207  
Anchorage, Alaska 99503-3038  
(907) 272-1481

October 16, 1989

Branch of Environmental Evaluation  
Minerals Management Service  
381 Eldon Street, Mail Stop 644  
Herndon, Virginia 22079

Supplemental Environmental Impact  
Statement, 5-Year OCS Oil and Gas  
Leasing Program Mid-1987 to Mid-  
1992

Gentlemen:

The Alaska Oil and Gas Association (AOGA) is a trade association whose member companies account for the majority of oil and gas exploration, production and transportation activities in Alaska. Many of AOGA's members have substantial holdings of OCS leases secured in lease sales conducted by the Minerals Management Service (MMS) in the past and anticipate participating in future sales. We appreciate this opportunity to comment on the Supplemental Environmental Impact Statement (SEIS) for the 5-Year OCS Oil and Gas Leasing Program for Mid-1987 to Mid-1992. These comments are intended to supplement our testimony presented at the September 28, 1989 public hearing conducted in Anchorage, Alaska.

The SEIS states that this document was prepared to respond to the court's ruling (December, 1988) that the Final Environmental Impact Statement (FEIS) failed to adequately analyze the cumulative impacts of the proposed 5-year leasing program on migratory species. This SEIS is intended to supplement the cumulative impact analysis contained in the FEIS and to assess whether changes to the 5-year program are warranted.

This SEIS relies on resource estimates and corresponding exploration, development and transportation scenarios contained in the FEIS (issued January 1987). MMS utilized the FEIS estimates "... to provide consistency between the FEIS and the SEIS" and to comply "... with the court's remand for the Secretary to review the leasing program, as adopted, (emphasis added) and to supplement the previous cumulative analysis."

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Branch of Environmental Evaluation  
Minerals Management Service  
October 16, 1989  
Page 3

The SEIS does recognize that "since the publication of the FEIS" a joint MMS and U.S. Geological Survey (USGS) assessment of the undiscovered oil and natural gas resources of the nation was carried out." Table II.B.1-2 contains data from that updated report, reflecting a significant decrease in these resource estimates for Alaska and a corresponding 56% reduction in the number of platforms for such development. The brief discussion in the SEIS of the MMS/USGS assessment recognizes "The decrease in the resource estimates in the new national assessment for eight of the Alaska planning areas is generally attributed to geologic information gained from unsuccessful exploratory drilling since the publication of the FEIS."

The SEIS states that the changes in the resource estimates were evaluated by MMS in terms of how they would affect the cumulative impact assessment and the assumptions previously used. Basic assumptions in the FEIS were considered still valid by MMS since there were no significant ~~increases~~ in infrastructure based on the new national assessment numbers. However, the SEIS recognizes that the decreases in conditional mean resource estimates, based on professional judgment, would result in lowering potential impacts associated with the development of these resources.

Unfortunately, the larger estimates contained in the assumptions in the FEIS have led MMS to conclude that the cumulative impact on the northern fur seal is expected to be high. This conclusion has led to the suggestion contained in Alternative II that the deferral of development and transportation of oil resources within the St. George Planning Area during this and future 5-year programs would reduce the impacts to the northern fur seal from high to moderate. We believe that based on impacts associated with the updated resource estimates, (i.e., a reduction in the number of wells to be drilled in this area from 591 to 53) there is clearly no justification to consider the deferral suggested in Alternative II.

In the oil spill section, the SEIS states that oil spills are considered one of the single greatest potential impacting agents to the environment from oil and gas activities. The SEIS recognizes on page IV-4 that OCS platform and pipeline oil spill occurrence rates have been updated since publication of the FEIS; these rates are significantly reduced from earlier estimates. However, to maintain consistency between the SEIS and the FEIS, the FEIS spill rates were used. Again, if the "new", reduced rates had been used in the SEIS the probability of impact to the subject migratory species would have been reduced and, if analyzed in conjunction with the updated MMS/USGS resource estimates, the impacts would have been reduced even further.

Branch of Environmental Evaluation  
Minerals Management Service  
October 16, 1989  
Page 3

The authors of the section on marine mammals have done a very good job at summarizing the most recent information. The analyses that have been used to assess the potential cumulative impact on cetaceans are conservative, and thus where the MMS has erred, it has been in the direction of caution. Perhaps the largest area of overestimation of impacts relates to the cumulative impact of disturbance from operations. The animal behavior phenomenon of habituation will result in a diminution of response with repeated exposure to non-harmful activities, such as vessel movements and drilling operations. In other words, the response (impact) will become smaller, not greater, with repeated exposure. The SEIS recognizes this in some places (e.g. p. IV-22), but not others.

We have a particular concern with statements in paragraph 7, p. IV-17. Much of this paragraph is quite ambiguous. We have interpreted the first sentence to mean that whales are expected to become sensitized by being near industry vessels so that Native whalers would have increased difficulty in closely approaching whales in their power boats. There is no basis given for this conclusion, nor do we believe that there is any evidence to support it. First, animals habituate to activities that are harmless and not directed toward them. Industry vessels (which are diesel powered) tend to move slowly and steadily and on straight courses; these are characteristics that tend to be less disturbing. Whaling boats (powered by outboard motors) travel more rapidly, are more erratic in speed and course, and actually pursue whales; these are characteristics that tend to be disturbing. Given that diesel engines and outboard motors have different sound characteristics, it is likely that bowheads can distinguish between these types of vessels. The meaning and relevance of much of the remainder of this paragraph is unclear. In the absence of solid evidence, this paragraph should be omitted or completely revised to remove what appears to be unfounded speculation.

Despite our criticism with regard to the use of updated resource estimates and spill occurrence rates, we believe the SEIS completely responds to the court's directive to analyze cumulative effects on migratory species. Utilizing the FEIS resource estimates, and assuming simultaneous development, the SEIS addresses the most active and ambitious development of the OCS that one could ever expect to occur. Accordingly, cumulative effects have been more than adequately addressed.

In the discussion on Alternative I it is noted that "the incremental effects of the current and future 5-year programs are not expected to raise the overall impact level for any migratory species except

Branch of Environmental Evaluation  
Minerals Management Service  
October 16, 1989  
Page 4

the northern fur seal". Based on our comments above on northern fur seal impacts and the Secretary's analysis of water species in the EIS we strongly recommend the Secretary adopt Alternative I. Adoption of this Alternative will result in expedited exploration and development of OCS oil and gas resources to achieve national economic and energy policy goals, as mandated by the OCS Lands Act, as amended.

Sincerely,

*William W. Hopkins*  
WILLIAM W. HOPKINS  
Executive Director

WHH:td4:408

American Petroleum Institute  
1220 L Street, Northwest  
Washington, D.C. 20008  
202-682-6170



S. P. Chamberlain  
Director, Operations

October 17, 1989

Branch of Environmental Evaluation  
Minerals Management Service  
381 Elden Street, Mail Stop 644  
Herndon, Virginia 22070

Re: Supplemental Environment Impact Statement,  
5-Year OCS Oil and Gas Leasing Program  
Mid-1987 to Mid-1992

Gentlemen:

The American Petroleum Institute (API) is a trade association representing over 200 companies involved in all aspects of the oil and gas industry, including exploration, production, transportation, refining and marketing. API appreciates this opportunity to comment on the Supplemental Environmental Impact Statement (SEIS) for the 5-Year OCS Oil and Gas Leasing Program for Mid-1987 to Mid-1992.

On July 2, 1987, the Secretary of the Interior approved the current Five-Year OCS Oil and Gas Leasing Program. Following this approval, the Natural Resource Defense Council, the states of California, Florida, Massachusetts, Oregon and Washington, among others, filed suit in the United States Court of Appeals for the District of Columbia Circuit, challenging the proposed OCS program on a variety of grounds, including alleged violations of the National Environmental Policy Act, the Outer Continental Shelf Lands Act and Public Law 99-391, Continuing Appropriations for Fiscal Year 1987. As you well know, API became actively involved in the litigation, having intervened as respondent.

On December 30, 1988, the Court of Appeals ruled in favor of the Department of the Interior on all but one of the grounds upon which the program had been challenged. The Court held that in the Final Environmental Impact Statement for the proposed 5-Year Program, the Secretary failed to perform an adequate analysis of the leasing program's potential cumulative impacts on migratory species. API understands that the SEIS was prepared in response to the court's ruling and we applaud the efforts of the Secretary of the Interior to comply with the court's ruling.

An equal opportunity employer

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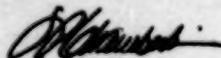
Branch of Environmental Evaluation  
October 17, 1989  
Page 2

Of the three alternatives to simultaneous development set forth in the SEIS, API recommends that the Secretary of the Interior adopt Alternative I. Alternative I not only provides for the expedited exploration and development of the Outer Continental Shelf, but results in overall cumulative impact levels on migratory species that are moderate to low. (SEIS, Table II.B.1-3).

API does not support either Alternatives II or III. Alternative II proposes the deferral of the St. Georges Planning Area, while Alternative III calls for the deferral of remaining lease sales in the current leasing program in the Alaska and Pacific region. Neither of these alternatives comply with the OCS Lands Act which provides for the "exploration and development of OCS oil and gas resources to achieve national economic and energy goals."

API firmly believes that development of the OCS is vital to this nation's security, and will serve to reduce dependence on foreign sources as well as maintain a favorable balance of payments in world trade. Under the current leasing program, OCS lease sales already suffer from frequent litigation, sale cancellations and postponements and legislative moratoria. To defer additional leasing areas or to set aside future lease sales would only exacerbate the difficulties and increase the rising costs already faced by the oil and gas industry in developing the OCS.

Sincerely,



12.1

**CALPIRG**

155-4  
750 J Street, Suite 1117, Sacramento, CA 95811 (916) 448-4516  
CALIFORNIA PUBLIC INTEREST RESEARCH GROUP

L1

September 28, 1989

**CALPIRG TESTIMONY ON THE SUPPLEMENTAL ENVIRONMENTAL IMPACT STUDY  
FOR THE PROPOSED O.C.S. 5 YEAR LEASING PLAN**

Until the U.S. has developed a comprehensive national energy policy, CALPIRG is opposed to the 5 year plan to lease out the outer continental shelf for oil drilling. The longterm damage this shortsighted plan does to a good national energy policy is paralleled by the longterm damage poor environmental impact studies do to the ocean and coastal environments.

The fact that the original environmental impact study (EIS) did not include the cumulative impacts on migratory species such as whales and birds illustrates the incomplete protection that marine ecology and wildlife may receive under the proposed lease sales.

Using up our offshore oil reserves as a stop-gap measure for energy, rather than developing a long term energy policy is poor policy. Both the original EIS, and this supplemental EIS illustrate that the implementation of this leasing plan may show no improvement in the consideration that went into the proposal.

In short, CALPIRG has grave concerns about the energy policy that the 5 year lease sales embody, and the EIS process is confirming our fears that the plans are not only poor energy policy, but poor environmental policy.

If you have further questions, please feel free to contact me at (916) 448-4516.

Mary Rafferty  
CALPIRG Legislative Representative

11.1

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V55

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The applicant certifies herein that the viewpoint of the undersigned

Jerry E. Clarke Mayor  
Council Members  
Robert Dunbar  
Norman E. Brown  
Stephanie Brown  
Michael R. Smith

400 CAPITOLA AVENUE  
CAPITOLA, CALIFORNIA 95010  
TELEPHONE (408) 475-7200

September 25, 1989

Mr. Debra Purvis  
Branch of Environmental Evaluation  
Minerals Management Service  
301 Eldon Street  
Norndon, VA 22070

RE: Supplemental Environmental Impact Statement for 1987-92 Five Year  
Plan for Oil and Gas Development

Dear Mr. Purvis:

This letter constitutes the City of Capitola's comments with regard to the Supplemental Environmental Impact Statement (SEIS) for the 1987-92 Five Year Plan for Oil and Gas Development. Our City participated via the public comment process in the development of the Five Year Plan, and has participated in decisions and discussions regarding potential offshore oil development off California.

Our comments will be limited to the SEIS as it relates to the impacts of offshore development on migratory species. The migratory species--those which "migrate" within more than one planning area--studied in your document include the Bushyhead, Cray, Fin, Humpback, Sporn, Right, Blue, Beluga, Minke and Sei Whales; the Northern Fur Seal; Stellar Sea Lion; Guadalupe Fur Seal; California Sea Lion; and birds including the California Least Tern, Brown Pelican, Arctic and American Peregrine Falcons, and the Short-tailed Albatross as well as geese, waterfowl, and shorebirds. Many of these species are classified as endangered or threatened.

The SEIS' Executive Summary states, in its explanation of Alternative III - No Action, that "... a comparison of the effects from existing activities and the current and future five year programs indicates that the (current) five year program does not increase impacts to migratory species above impact levels from existing (offshore oil) activities with the exception of the northern fur seals." Common sense, and knowledge of the devastating effects of the Exxon Valdez spill, would lead the City of Capitola to disagree with that statement. Since some of the migratory species listed in your SEIS migrate within the two planning areas currently without offshore development, we would disagree with the SEIS's observation that impacts to migratory species are not higher than levels in the area with "existing activities".

L2.1

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L2

Mr. Debra Purvis

-2-

September 25, 1989

The National Environmental Policy Act (NEPA) states that all reasonable alternatives to simultaneous development of Five Year Plan lease sales - which would mitigate impacts on migratory species - should be examined. We believe the analysis which lead to the conclusion that the Northern Fur Seal is the only species with high impact is flawed. A better analysis, showing the more realistic impacts on migratory species, would result in more defined alternatives. We believe the analysis is flawed because it is constrained by a requirement that a species - endangered or not - concentrate in one vicinity for an impact to "impact" it. According to your SEIS, the concentration would allow an impact-producing event, such as an oil spill, to cause a threshold impact to cause mortality, or decrease in reproductive activity beyond the natural increase in that species' population. The assumption, of course, is that a dispersed species will not suffer losses greater than its population increase over a given period of time. The City of Capitola suggests the inclusion of alternatives such as: deletion of areas from consideration which are key spawning, feeding, or calving areas; the establishment of "buffer zones" to those areas; or the slowing of the pace of lease sales to allow the evaluation of new information on damage from cumulative impacts.

L2.2

The City questions the SEIS' methodology for how "impact levels" are assigned. For example, "generation" is a time unit used to assess impact. But generations vary amongst different species. An impact lasting five years will have a much different effect on a species which matures at ten years as opposed to one that matures in two. We are concerned that lower impact levels may be assigned because a lower number of years may be used to equal a "generation". The number of years used is not clear in the SEIS. We believe that any population decrease caused by oil development is unacceptable, although the SEIS may assign such a decrease a "low impact".

L2.3

Thank you very much for your time and attention to our comments. We look forward to receiving the final SEIS.

Best regards,

CITY OF CAPITOLA

Jerry Clarke  
Mayor

JEC:pee  
cc: Rep. Leon Panetta  
Save Our Shores

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October 11, 1989

Ms. Dobra Purvis  
Branch of Environmental Evaluation  
Minerals Management Service  
301 Eldon Street  
Huron, MI 49570

Dear Ms. Purvis:

Supplemental Environmental Impact Statement for  
1987-1992 Five Year Plan for Oil and Gas Development

The City of Santa Cruz is pleased to provide comments on the Supplemental Environmental Impact Statement (SEIS) for the 1987-1992 Five Year Plan for Oil and Gas Development. The City of Santa Cruz participated via the public comment process in the development of the Five Year Plan, and the City has actively opposed offshore oil development off California. The City continues to stand by all the comments it made during the development of the Plan.

The City's comments here will be limited to what the Santa Cruz City Council perceives as weaknesses in the SEIS as it relates to the impacts of offshore development on migratory species. Migratory species - those which "migrate" within more than one planning area - studied in your document include the Bowhead, Gray, Fin, Humpback, Sperm, Right, Blue, Balap, Hinko and Sei Whales; the Northern Fur Seal; Steller Sea Lion; Guadalupe Fur Seal; California Sea Lion; and birds including the California Least Tern, Brown Pelican, Arctic and American Peregrine Falcons, and the Short-tailed albatross as well as geese, waterfowl and shorebirds. Many of these species are classified as endangered or threatened.

To begin with, we have a general comment. The Executive Summary states, in its explanation of Alternative III - No Action (no new lease sales, including California Sales 119, 91 and 96 under the current Five Year Plan), that "...a comparison of the effects from existing activities and the current and future five-year program indicates that (this) five year program does not increase impacts to migratory species above impact levels from existing (offshore oil) activities with the exception of the northern fur seals." We believe that common sense, coupled with new knowledge of the devastating effects of the Prince William Sound, Alaska spill, contradicts that statement. "Existing activities" in California occurs in only one of three planning areas. Since

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Dobra Purvis  
October 11, 1989  
Page 2

some of the migratory species listed in your SEIS migrate within the two planning areas not under development, the SEIS's observation that impacts to migratory species are not higher than levels in the area with "existing activities" just does not make sense.

During litigation of the Five Year Plan which resulted in the SEIS, the court suggested that all reasonable alternatives to simultaneous development of Five Year Plan lease sales which would mitigate impacts on migratory species be examined. This is also consistent with the National Environmental Policy Act (NEPA) requirement that alternatives to the action under study be considered.

Alternative II - Defer leasing in one or more planning areas - makes an attempt at this but it only deals with the St. George Planning area off Alaska in relation to the Northern Fur Seal. However, we believe the analysis which leads to the conclusion that the Northern Fur Seal is the only species with high impact is wrong. A better analysis would result in now, more defined alternatives. We believe the analysis is flawed because it is constrained by a requirement that a species - endangered or not - concentrate in one vicinity for an impact to "impact" it. According to your SEIS, the concentration would allow an impact-producing event, such as a oil spill, to cause a threshold impact to cause mortality, or decrease in reproductive activity beyond the natural increase in that species' population. The assumption, of course, is that a dispersed species will not suffer losses greater than its population increase over a given period of time.

Our alternative to the result of the flow we perceive in the SEIS's analysis is to include alternatives such as: deletion of areas from consideration which are, or adjacent to, key spawning, feeding, or calving areas; the establishment of "buffer zones" to those areas; or the slowing of the pace of lease sales to allow the evaluation of new information on damage from cumulative impacts.

The SEIS missed two migratory species: The Ashy Petrel bird and Pacific Hake fish. In the species' descriptions in your SEIS there is missing in many cases the location of feeding grounds, the identity of prey species, and a description of the reasons (mating, seasonal travel) for migration.

There does not seem to be a discernable methodology for how "impact levels" are assigned. For example, "generation" is a time unit used to assess impact. But generations vary amongst different species. An impact lasting five years will have a much different effect on a species which matures at ten years as opposed to one that matures in two. We are concerned that lower impact levels may be assigned because a lower number of years may be used to equal a "generation". The number of years used is not clear in the SEIS. We believe that any population decrease caused by oil development is unacceptable, although the SEIS may assign such a decrease a "low impact".

L3.1

L3.2

L3.3

L3.4

L3.5

Debra Purvis  
October 11, 1989  
Page 3

Thank you very much for your time and attention to our comments. We look forward to receiving the final SEIS.

Sincerely,

*Meredith Wornthout*

Meredith Wornthout  
Ryer

cc

cc: Rep. Leon Panetta  
Save Our Shores

Oct. 17 '89 14:44

0000 NREC

TEL 1-212-727-1773

P. 2/11

L4



Natural Resources  
Defense Council

25 West 22nd Street  
New York, New York 10011  
212 727-3200  
FAX 212 727-4770

COMMENTS  
OF  
THE NATURAL RESOURCES DEFENSE COUNCIL  
ON THE DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT  
ON THE 5-YEAR OUTER CONTINENTAL SHELF OIL AND GAS  
LEASING PROGRAM (NID-1987 - NID-1993)

October 17, 1989

Prepared by:

Sarah Chavis  
Lisa Speer  
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V58

247



The Natural Resources Defense Council (NRDC) submits the following comments on the Draft Supplemental Environmental Impact Statement (SEIS) on the 5-Year OCS Oil and Gas Leasing Program. As the lead litigant in the lawsuit challenging the current 5-Year Program which led to the U.S. Court of Appeals for the District of Columbia's ruling that the Final EIS failed to adequately analyze the cumulative impacts of the leasing program on migratory species, NRDC has a strong interest in ensuring that this SEIS is adequate. We believe that in a number of a major respects it is seriously deficient. Perhaps most strikingly, the SEIS fails to reevaluate a number of critical assumptions made in the FEIS, regarding the fate and effects of spilled oil, in light of the recent Exxon Valdez oil spill in Prince William Sound. As detailed below, a number of these assumptions, such as those regarding the likely weathering of oil, the area affected by a spill, and the effects of a spill on different species, are no longer valid. Wherever in the SEIS are these points acknowledged or disavowed, nor is the information on the impacts already known to have occurred as a result of the Prince William Sound spill factored into the cumulative impact analysis in terms of assessing whether certain populations affected by that spill will be further affected by OCS activities contemplated in the 5-Year Program. This and other issues are discussed below.

#### A. The Oil Spill Risk Analysis

##### 1. Failure to incorporate Exxon Valdez information into the SEIS.

DOI states (see p. IV-4) that the SEIS takes into account the Exxon Valdez spill, but there is no evidence of this in the analysis of spill risk, fate and effects, clean up and containment, or other issues. The Department should thoroughly analyze all of its assumptions regarding these issues and compare them with the experience of the Exxon Valdez in the final SEIS. Particular attention should be paid to the following issues.

##### a. Spill Occurrence

The SEIS states that the assumptions in the 5-Year FEIS regarding the likelihood of a spill occurring includes 7 spills attributable to oil transport from TAPS with a probability of >99% of one or more spills occurring. Communication with NM spill modeling personnel indicates that the Exxon Valdez spill will not affect DOI's tanker spill rate, and indeed that the Prince William Sound spill will bring the actual spills observed from transporting Prudhoe Bay crude up to roughly what NM had predicted. NM should set forth the data to support that claim and clearly state how many more Exxon Valdez type accidents NM expects to occur as a result of oil transport out of Valdez.

##### b. Spill Size

The SEIS only evaluates spills equal to or greater than 1,000 barrels. The Exxon Valdez spill was 240 times that size. A spill of 1,000 or 2,000 barrels will clearly have a very

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different impact from a spill of a 100,000 or 200,000 barrels. A larger spill will likely have more cumulative impacts, because species cannot escape to unoiled areas as easily and because oil is more likely to persist due to inability to clean large areas, resulting in repeated exposures. Lumping all spills of 1,000 barrels or more together in assessing potential cumulative effects may well mask very dramatic effects that a much more major spill would have. We believe that rather than simply analysing the cumulative effects of spills of 1,000 barrels or more there should be an explicit assessment of the effects that spills of specific size (such as a 100,000 barrels or more) would have cumulatively on the OCS. The SEIS should examine what the implications there would be, for example, of several tanker spills of 100,000 barrels or more occurring up and down the coast as a result of transport of OCS oil. Such a scenario is hardly unrealistic given the number of tanker spills that have occurred along the Alaska and Pacific coasts as a result of the transport of Alaskan crude oil to the Pacific coast.

L4.4

A second issue related to spill size is that the OCSA does not consider spills of less than 1,000 barrels, despite the fact that most spills are in the range of 1-1000 barrels (SEIS at IV-4). Spill data compiled by the Department indicates that several hundred spills of less than 1,000 barrels occur per billion barrels of oil produced. Given that the Department projects over 16 billion barrels of oil may underlie the Alaskan and Pacific planning areas, thousands of small spills can be expected to

L4.5

occur, some of them repeatedly in the same location. The Department should analyse the cumulative effects of repeated small spills.

#### c. Area Affected

The SEIS uses a May 2 figure of 350 miles of shoreline affected by the Exxon Valdez spill. The Coast Guard recently estimated that 1354 miles of coastline was affected. The Department should also update its figure relating to the area the spill spread over, explain how this estimate differs from that in the FEIS, and revise the impact analysis accordingly.

L4.6

#### d. Oil Spill Containment and Cleanup

The SEIS simply refers the reader to the discussion of this issue in the FEIS. The success (or lack thereof) of containment and cleanup in the wake of the Exxon Valdez should be addressed in the SEIS, since that experience provided important new information about the almost total inability of the industry to contain and clean up major spills, which directly relates to the severity of cumulative impacts.

L4.7

#### e. Fate

The same comment applies to the fate (e.g., transport, weathering, persistence, the possibility of re-oiling shores, etc.) of spilled oil in the marine environment. A great deal of new information on the fate of oil in Alaskan waters came out of the Exxon Valdez incident. DOI should revise and update its discussion of the fate of spilled oil to incorporate new information.

L4.8



## f. Table IV-B.4-1

This table presents the estimated mean number of spills greater than 1,000 barrels by planning area. Nowhere in the analysis are there estimates of the number of spills that will take place outside planning areas in places like ports and harbors. Since there have been many instances of tanker accidents in state waters and ports, the possibility of an OCS oil tanker spill in such areas is very real. The Department should analyze the potential for such spills on a cumulative basis and assess resulting impacts.

14.9

## g. Unexplained Assumptions

There are some specific assumptions made which need further explication. For example, what precise level of exploration, development and production in the Pacific and Atlantic regions is assumed to occur simultaneously? The SEIS says "some level..." of simultaneous activities assumed (II-3). This should be explained in detail in the Final SEIS. Another point that needs explication is which areas were selected for the assumption that two large oil spills will occur in a given year (see IV-4). The specific areas should be identified and the rationale for their selection given.

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## h. Bristol Bay

The footnote for Table IV-B.4-1 assumes that all oil will be moved out of the North Aleutian Basin via pipeline, thus not exposing that region to any tanker traffic at all. This assumption is different from assumptions made in the Sale 93 EIS

14.12

and EA regarding the possibility for tanker transport of oil from an offshore loading facility in Bristol Bay through Unimak Pass to market. Had tanker traffic been assumed for transport within Bristol Bay, this highly productive region would have been shown to be exposed to a greater risk of a oil spill. (Particularly given the new figures on pipeline and platform spill rates). The SEIS assumption would seem to understate the risks to this biologically important region.

14.12

2. Outdated assumptions regarding the amount of oil in each planning area.

Because spill risk is calculated per million barrels of oil produced and transported, the oil estimates for each planning area are an important determinant of spill risk. The Department recently updated oil and gas estimates for each planning area.<sup>1</sup> The new estimates for the West Coast are substantially different from the estimates used in the SEIS and the FEIS:

RISKED BOE ESTIMATES<sup>2</sup>

|        | SEIS/FEIS | New estimates |
|--------|-----------|---------------|
| S-Cal. | 3340      | 3239          |
| C-Cal. | 260       | 334           |
| N-Cal. | 450       | 823           |
| WA/OR  | 152       | 135           |
|        | 4202      | 4230          |

14.13

1. USGS and MMS, August 1989. Estimates of undiscovered conventional Oil and Gas Resources in the United States.

2. From SEIS, Tables II-B.1-1 and 2. Because the SEIS consolidates the new estimates for oil and gas together as BOE, it is impossible to directly compare oil estimates. We urge the Department to present the new estimates for oil and gas separately in the final SEIS. Estimates given above are risked in order to allow comparisons between assessments (SEIS at II-2).

We note that the total oil and gas off the West Coast has risen. Perhaps more importantly, its location has shifted, with Southern California (where DOI projects less use of tankers) experiencing a reduction and Central and Northern California (where all oil will be transported by tanker)<sup>3</sup> increasing by as much as 38%.

The SEIS claims that while decreases in resource estimates will lower potential environmental impacts, increases will not. (SEIS at II-3). NRC cannot have it both ways. We fail to see how the recent substantial increase in resource estimates will not translate into increased risk.

L4.14

### 3. Projects Considered in the Cumulative Impact Assessment

The Department failed to include a major new commercial oil find (300 million barrels) on Alaska's North Slope in the cumulative impact assessment. ABCO has called the new discovery at Pt. McIntyre "one of the largest domestic finds in the last 10 years." The inclusion of this project will undoubtedly increase spill risk and cumulative impacts.

L4.15

### 5. Analysis of Impacts

There are some other startling aspects of this SEIS that give us cause for concern. The SEIS concludes that, except for fur seals, the deferral of leasing anywhere along the Atlantic or Pacific region will not reduce the overall impacts on migratory

3. SEIS Table IV.B.4-1.

species. This conclusion seems absurd in light of the fact that, for a number of planning areas, a large number of spills is predicted to occur as a result of new OCS development (for example, 13 spills for the Nueces Basin and 5 spills in Southern California) and the recognition that several of the populations of migratory species affected are already stressed.

L4.16

The conclusions in each section that the impacts will be moderate or low are extremely arbitrary. For example, in the discussion of potential impacts on California brown pelicans, the SEIS concludes that the overall cumulative impacts to brown pelicans are expected to be "moderate" (IV-43) and that a reduction in impacts would not result from deferring leasing in any of the Pacific Planning areas even though the expected number of spills that this population would be exposed to increases from 7 to 12 as a result of current and future five-year programs. This makes no sense and seems to be based on the unsubstantiated assumption that these spills will be dispersed both in time and space (see discussion at the top of IV-43). However, it is entirely possible that the anticipated spills could be clumped together in time and/or space and affect important population centers of this species.

L4.17

Another example of the arbitrariness of the assessment is in the discussion of overall impacts on seabirds (IV-57-60). As seen in the Exxon Valdez oil spill, seabirds can suffer major impacts from an oil spill. While the discussion acknowledges that the number of birds killed could be significant and that

L4.18



regionally high or locally high impacts could occur, the SEIS concludes that the cumulative impacts are expected to be only moderate. It is not at all clear why this is an appropriate conclusion. A clearer and stronger rationale needs to be provided justifying this apparently arbitrary conclusion.

14.18

Also included should be a discussion of the impacts of cleanup activities. Disturbance effects related to the cleanup are thought to have contributed to the fact that 60-70% of the active bald eagle nests in Prince William Sound were abandoned.

14.19

The cumulative impact discussion in the SEIS of noise and disturbance impacts consists of 5 sentences and is totally inadequate. Much research on this point has been done since 1982. MMS should update its information and assess cumulative effects of noise disturbance in addition to other effects.

14.20



## Northwest Indian Fisheries Commission

P.O. Box 1029, Feds, WA 98331 Phone (206) 374-5501 FAX (206) 374-5502

October 11, 1989

Debra Purvis  
Branch of Environmental Evaluation  
Minerals Management Service  
3951 Hiden Street  
Herdon, VA 22070

Dear Ms. Purvis:

After reviewing the Supplemental Environmental Impact Statement (SEIS) for the Five Year Leasing Program, I have several comments concerning the assessment of potential impacts to the fishery resources in the Pacific Region. Overall, I found the estimates of projected impacts from oil and gas activities to be overly optimistic and lacking in coverage of several key management and resources issues.

The most striking omission in the document is the lack of any acknowledgment of the United States Federal Government's treaty obligation to the tribes of Western Washington with regards to fishery resources. Both the EIS and SEIS fail to address the potential impacts that exploration and development activities will have on the treaty fishing rights of the tribes. Additionally, both documents lacked discussion concerning the potential ramifications that OCS activities may have on the allocation of fishery resources (treaty and non-treaty) in the Northwest. The SEIS briefly notes the treaty/non-treaty allocation of the steelhead resource, but fails to recognize this general principle applies to all fish and shellfish resources in the region. The lack of consideration of these issues, I believe, results in the underestimation of potential impacts that could result from exploration and development activities in the Pacific Region.

15.1

The document is also missing impact assessments for the halibut and walleye pollock resources found within the Pacific Region. The report correctly identifies the range of walleye pollock to include Oregon, Washington, and California, but no discussion is provided on possible impacts to the population and associated fisheries. Completely missing is an impact analysis on the Pacific Halibut (*Hippoglossus stenolepis*) stocks which are highly migratory. The adult population within the Pacific Region spawns in Canada and Southeast Alaska and the resulting juveniles spend the early stages of their life in the Bering Sea and Gulf of Alaska before migrating south. These omissions need to be addressed and included in the subsequent work from the Minerals Management Service.

15.2

Finally, some inaccuracies occur in the presentation of multiple year class spawning of salmon and steelhead. With respect to Chinook and Chum salmon, it cannot be assumed that the buffering effect of multiple year class spawning would completely mitigate for the significant reduction of a complete year class. Generally for these species, a river's spawning run is dominated by a particular year class (three, four, or five year olds - depending on the river system). It is unrealistic to assume that buffering from other year classes would make up for the loss of the predominate year class, nor can it be assumed that the stock could be rebuilt from significant underescapement in just one brood cycle. Often a minimum of two to three brood cycles, or four to 12 years, is required. In addition, coho and pink salmon are single year class spawners and resulting impacts on these species therefore, would be more severe. I feel the conclusions in the SEIS should be amended to reflect these considerations.

Sincerely,

*Craig Bouhey*  
*Craig Bouhey*

Craig Bouhey  
Coastal Coordinator

CSB:mnc

L5.3

L5.4



**Cenaliurrit**

Coastal  
Management  
District

For the Yukon-Kuskokwim Coastal Resource Service Area  
P.O. Box 1169 • Bethel, Alaska 99559 • 907/543-2243

L6

October 18, 1989

Debra Purvis  
Branch of Environmental Evaluation  
Minerals Management Service  
381 Elden Street (Mail Stop 644)  
Nerdon, VA 22070

Re: Supplemental Environmental Impact Statement (SEIS)  
3-Year Outer Continental Shelf (OCS) Oil and Gas Leasing  
Program

Dear Debra:

The Cenaliurrit Coastal Management District (CCMD) has reviewed the SEIS 3-Year OCS Oil and Gas Leasing Program for Mid-1987 to Mid-1992 and recommends "Alternative III" of the program and strongly urges to defer all remaining lease sales in the current 3-year program within the Alaska Region until there is a full guarantee no adverse environmental consequence will occur.

L6.1

The Bristol Bay, Bering Sea and Aleutian Islands areas are essential and critical habitat areas for biological species important for all of Western Alaska including those dependent along estuaries directly related to those areas.

It is impractical to conduct any activity in the Alaska Region considering the unpredictable meteorological conditions and oceanographic currents that will cause adverse economic and ecological impacts to all of Western Alaska; the social, economic, cultural, and traditional lifestyles will be severely endangered. The magnitude of environmental and economic disasters will far outweigh that of Prince William Sound. Aside from the Bering Sea bottom fisheries and fisheries on the Yukon and Kuskokwim rivers, Bristol Bay fisheries alone employ more than 10,000 people every year and produces an average of \$1-2 billion on renewable resources, compared to that of a short ranged nonrenewable resource.

The CCMD, as part of the Alaska Coastal Management Program, finds the 3-year OCS program inconsistent and in violation of the National Environmental Policy Act and Outer Continental Shelf Lands Act.

OFFICIAL CONSISTENCY REVIEW

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Branch of Environmental Evaluation  
5-Year OCS Leasing Program  
Page Two

Thank you for the opportunity to comment.

Sincerely,  
CENALULRIIT COASTAL MANAGEMENT DISTRICT

*[Signature]*  
Oscar  
Consistency Review Officer

cc: Cenaliulriit Board of Directors  
Joanlin Eatus, DGC-Juneau  
Luka Smith, DCRA-Bethel  
Bristol Bay CESA  
Bering Straits CESA  
Aleutians West CESA



U.S. DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT  
1015 N. G Street  
Fairbanks, Alaska 99701  
Tel: 907-457-2500

October 11, 1989

Dobes Purvis  
Branch of Environmental Evaluation  
NNE - Mail Stop 644  
381 Kiden St.  
Noraden, VA 22070

RE: Comments on the Supplemental Environmental Impact Statement 5-Year Outer Continental Shelf Oil & Gas Leasing Program, Mid 1987 to Mid 1992

Dear Mr. Purvis,

The Oregon Natural Resources Council (ONRC) appreciates the opportunity to comment on the Supplemental Environmental Impact Statement (SEIS).

Generally, ONRC comments address the inadequacy of the initial premises and definitions used in the SEIS analyses rather than the actual conclusions. ONRC suggests that acceptable conclusions cannot be drawn from flawed premises.

Specifically, ONRC questions the veracity of the following premises, definitions, assumptions and models used in the SEIS:

- Impact level definitions (SEIS at Appendix A) are identical for all resource categories; all refer to duration of effects in terms of generations or years regardless of the species involved. For example, a "moderate" level of impact is described as: "A population declines resulting in a change in the distribution and/or abundance of the species. The expected duration of the effects is less than one generation or 3 to 5 years." NNE would ask us to apply this arbitrary definition to fish, marine mammals, and marine birds alike. While 3-5 years might approximate a generation of salmonids, it is but a fraction of a generation of most marine mammals. Similarly, these same definitions are used for endangered and threatened species as well as nonendangered species. Changes in distribution and/or abundance of endangered species could be expected to have significantly greater impact than changes involving nonendangered species. Specific impact definitions for each group of species must be used to approach an accurate impact statement.

- The only migratory species addressed in the SEIS are those of the Pacific and Alaska OCS regions. There is no analysis of impacts to Atlantic and Gulf migratory populations whatsoever, in spite of the fact that migratory species abound in these regions as well.

- Though the court suggested (NRC, et al. v. Bodel) "the Secretary could examine alternatives to simultaneous development that would mitigate any cumulative impacts on migratory species," no true alternatives are considered in the SEIS. Having concluded that the only species to be significantly impacted by cumulative OCS

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L7

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and non-OCS development would be the northern fur seal, MMS progresses to a stated assumption that Alternative III (no action) would only result in a reduction of impacts to that species. Alternative II would defer OCS development in one planning area (St. George), thus reducing impacts to the fur seal population to "moderate". In other words, no true mitigating alternatives to achieve national economic and energy policy goals were considered; Alternatives II and III are merely brief restatements in support of Alternative I, the proposed action. Energy conservation and renewable energy systems are obvious alternatives to be examined, as has been suggested ad infinitum in response to the 5-Year FEIS.

- The assumption that only northern fur seals will be significantly affected by cumulative OCS and non-OCS development is achieved through a seemingly obscure process. Inadequate census data exists for most endangered and threatened cetaceans and marine and coastal birds. OMHC contends it is impossible to predict levels of impacts to distribution and/or abundance of a species without baseline data.

- The SEIS does not examine the consequences of cumulative effects of drilling rigs, formation water, air pollution, preemption of physical space, support vessel traffic, and increased tanker traffic in the many OCS regions where pipeline transport will not be available. Indeed, the only consequences of OCS development considered are large spills and noise pollution.

- Most information contained in the SEIS is merely "tiered down" from the FEIS. Little new information is presented. For example, though updated resource estimates were completed by MMS and the USGS in 1987 (National Resource Assessment), the SEIS uses the older estimates taken directly from the FEIS. This is also true for spill rates; new figures were available in 1988, but the SEIS merely reproduces the old information from the FEIS and the widely criticized oil spill model OSTRAN, which does not consider spills less than 1,000 barrels of oil, an omission of 99% of the oil spilled in the OCS.

- The one brief paragraph devoted to "Oil Spill Cleanup and Containment" (SEIS at IV-5) refers to the FEIS for "a detailed discussion of the various oil spill cleanup and containment equipment and their effectiveness..." The Exxon Valdez spill has evidenced the inadequacy of the assumptions presented regarding oil spill cleanup and containment in the FEIS, yet again no new information was presented.

It is to be hoped that the final SEIS will incorporate verifiable promises and relevant new data into its conclusions, examine all environmental consequences of OCS development - not just noise pollution and large spills - and consider true alternatives to leasing environmentally sensitive marine regions. OMHC perceives the draft SEIS to be little more than a condensed version of the wholly inadequate FEIS.

Thank you for the opportunity to comment.

Sincerely,

*Carol J. Alexander*  
Carol J. Alexander  
OCS Campaign



# CENTRAL COAST OCS REGIONAL STUDIES PROGRAM

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## CENTRAL COAST COUNTIES

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COORDINATOR  
Warren Chabon

October 16, 1989

Debra Purvis  
Branch of Environmental Evaluation  
Minerals Management Service  
381 Eldon Street  
Herdon, VA 22059

RE: Comments on the Draft Supplemental EIS for the Five-Year  
OCS Oil and Gas Leasing Program for 1987-1992

Dear Ms. Purvis:

On behalf of the Central Coast OCS Regional Studies Program, I am submitting the following comments on the Draft Supplemental Environmental Impact Statement (DSEIS), on the 5-Year OCS Oil and Gas Leasing Program for 1987-1992. Our review of the DSEIS identified the following errors and omissions that we wish to bring to your attention:

1) Under current Council on Environmental Quality (CEQ) regulations, the Minerals Management Service (MMS), should look at the cumulative effects of multiple sales in conjunction with other OCS activities (i.e. where several activities cumulatively create an impact greater than the sum of individual actions). Such a cumulative analysis is not conducted in the DSEIS.

2) The MMS poses the issue of cumulative impacts as trivial. The MMS claims there is "little chance of simultaneous activity along entire coast". The MMS implies that they are conducting this cumulative analysis because the Supreme Court required such a study. The DSEIS documents should not attempt to trivialize the cumulative impact issue and make it less than the importance which attended the issue by the U.S. Supreme Court. If the DSEIS makes this base assumption, then in fact, the MMS is flagrantly ignoring the directive of the Supreme Court.

3) The MMS analysis is very limited in discussing alternatives. Only three alternatives were considered:

- 1) The Secretary's current action 5-Year Plan for the 1987-1991 period,
- 2) Deferral of planning areas from 5 year program
- 3) No action.

The DSEIS only looked at the deferral alternative for those species with potential high impact, i.e. Northern fur seals. This DSEIS does not conduct any significant or substantial investigation into overall alternatives to the current 5-Year plan. In fact, this DSEIS simply investigates the absolute minimum mitigations deemed necessary by the MMS authors.

4) The DSEIS uses outdated and invalid oil spill rates established by Mr. Robert Labelle. New data from recent spills such as the Exxon Valdez is not factored into the spill rates. The MMS argues that the old information was used to insure "consistency." However, NEPA requires the use of best available information - not dated information for "consistency" purposes. Significant information has been developed as a result of recent spills on the short and mid-term impacts on seabirds and marine mammals. This newer information should be incorporated into the Supplemental DSEIS.

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- 5) The DSEIS inaccurately uses outdated information to demonstrate lower potential impacts. For instance, in estimating the number of platforms and other potential impacts from multiple lease sales, the DSEIS ignores the 12-22 platforms estimated in the Lease Sale #91 DSEIS. Rather the DSEIS uses the 2-3 platforms estimated in their original 5-Year Plan FEIS. | L8.5
- 6) The MMS transportation scenario does not address tankering of central or northern California OCS oil. | L8.6
- 7) The DSEIS makes many references to foreign tankers and foreign tanker spills. This apparently ignores the fact that (according to the California Energy Commission), the west coast only receives about 5-7% of its oil from foreign sources. | L8.7
- 8) The document looks at two basic sources of impacts such as: a) spills greater than 1,000 barrels and b) disturbances associated with OCS processes (i.e. seismic, construction and related impacts). However, there is no discussion of a very large oil spill of the magnitude of the 240,000 barrel Exxon Valdez accident. Such a spill is possible from either platform operations or a major transportation accident. | L8.8
- 9) The DSEIS offers virtually no discussion on the cumulative impacts of drilling muds and cuttings. | L8.9
- 10) The DSEIS has no discussion on the long term effects of oil in the environment following a major spill. The document assumes a major spill may affect whales for one year, but bottom feeding species (such as Grey Whales), could be traveling through the same area year after year could be subject to repeated contamination. This should be considered in the DSEIS. | L8.10
- 11) One of the major impacts from a spill is the impacts of cleaning up a spill. For example, the Exxon Valdez cleanup, included serious consideration of burning the oil on the water. The shoreline cleanup used high pressure hoses and herbicide based solvents. Such impacts should have been considered in the DSEIS. | L8.11
- 12) The DSEIS did not discuss possible impacts on the threatened Southern Sea Otter. This species, whose range includes the Central and Southern planning areas, is highly vulnerable to oil spills. The cumulative impacts of multiple sales throughout the range of the Southern Sea Otter should merit discussion in this DSEIS. | L8.12

In addition to the above comments, we wish to also incorporate by reference, the comments offered by the Natural Resources Defense Council and the California Attorney General's Office. As a result of these comments, we conclude that the DSEIS is fundamentally flawed in its scope, analysis and conclusions. We recommend that the document be revised by including a more comprehensive analysis of the cumulative effects of the 5-Year program. In addition, we recommend that a more significant range of alternatives be provided to the Secretary of Interior.

Respectfully,

*W. Chabot*

Warner Chabot  
Regional Coordinator

## WASHINGTON STATE COASTAL COUNTIES

Clellam County - Grays Harbor County - Jefferson County - Pacific County

4007 Latona Avenue N.E. Seattle, Wa. 98195 (206) 632-6255

U.S. Department of Interior  
Minerals Management Service  
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16 October 1989

### COMMENTS OF THE COASTAL COUNTY COORDINATION PROGRAM ON

#### Draft Supplemental Environmental Impact Statement 5-Year Outer Continental Shelf Oil and Gas Leasing Program Mid 1987 to Mid 1992

The lack of information on the distribution and abundance of the marine species occurring along the Washington and Oregon continental shelf makes the evaluation of cumulative impacts in the SEIS inadequate. | L9.1

To make up for the lack accurate population assessments, the SEIS should have addressed the cumulative impacts to the various life history phases of migratory species caused by the degradation of their critical breeding and feeding habitats which occur in more than one lease area. The significance of the Columbia River, Willapa Bay, Grays Harbor and Greater Puget Sound estuaries as breeding and nursery grounds for numerous migratory species is well documented and therefore should have been included in this analysis. | L9.2

The Final EIS on the 5-Year Program grossly underestimates the total area of our coastal estuaries which misrepresents the sensitivity of the lease area as well. MMS estimates there to be 45 square miles of estuarine habitat in the entire lease area (DOI 1987), while the Strategic Assessment Branch of NOAA calculates that Washington's three coastal estuaries comprise 364 square miles. This correction, which does not include the 6,949 square miles of estuarine habitat in Greater Puget Sound, changes MMS's calculation of relative marine productivity/environmental sensitivity from 256 to 334, making it the highest in the US OCS. The fact that the marginal oil reserves of Lease Sale #132 are expected to be adjacent to these highly sensitive and productive habitats requires a more careful analysis of this consideration in the SEIS. | L9.3

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The SEIS should have also conducted a quantitative analysis of the projected increase in levels of OCS and non-OCS related activities to provide some level of rigor to this subjective analysis. In addition, the omission of numerous species which move between more than one lease sale, within a planning area, and the lack of consideration of Canadian OCS activities renders this evaluation wholly inadequate.

19.4

The FEIS on the current 5-Year Program states, "Impacts to marine mammals, marine and coastal seabirds and threatened and endangered species from an oil spill will depend upon when and where the spill occurs, and if and how many species are effected, and the individual sensitivity of the species (IV.B.7. - 52)." The use of "candidate" or "key" species in the SEIS has under represented the region's species richness leading to such obvious omissions of animals as killer whales. NOAA's Platform of Opportunity Data clearly demonstrates the presence of this species throughout the NW (enclosed) and sightings of known individual whales have been made between SE Alaska and Northern Puget Sound (Leatherwood et al. 1984).

19.5

19.6

Another problem is the use of such broad categories as "seabirds" in the SEIS. This ignores the range of sensitivities that different species exhibit to spilled oil and other disturbances associated with OCS activities. For example, the common murre and marbled murrelet, which occur throughout the Pacific and Alaskan Planning Areas, have been shown to have the highest oil:bird-vulnerability index (King and Sanger 1979) and are subject to various impacts to their populations (Marshall 1989). In addition, the lack of specific reference to the bald eagle is another blatant omission of the SEIS.

19.7

19.8

The intentional omission of leatherback turtles is unwarranted. To justify their lack of inclusion in this analysis the SEIS states, "The only area in the Pacific Region where turtles are sighted with any frequency is the coastal waters of San Diego County (p.1-2)." In contradiction to this statement, fisheries observers on 59 sets of the Washington/Oregon experimental thresher shark gill net fishery reported the incidental take of 13 leatherback turtles (data enclosed).

19.9

There is also no mention of the Northern sea lion breeding rookeries of Rogue Reef and Orford Reef in Oregon. This species is highly vulnerable to population level impacts because of its reduced numbers and tendency to aggregate on haul outs (Felleman 1984). It is likely that it will be recommended for depleted or endangered status in the near future. The northern fur seal, to our disbelief, is the only species predicted to have a high cumulative impact level. The presence of both of these species, despite the lack of breeding sites along the continental shelf of Washington as documented by NOAA's Platform of Opportunity data (enclosed), emphasizes the importance of their exposure to cumulative impacts.

19.10

Also unacceptable is the limited number of fish species reviewed in the SEIS. The SEIS justifies not including many species by suggesting they are different from truly migratory species, such as salmon, by stating, "The coastal movements of these species are most likely related to reproductive activity, and seasonal changes in water temperature or other oceanographic conditions (p. 1-2)." These are precisely the reasons why migratory species, including salmon, migrate. The evaluation that cumulative impacts to salmon in the Alaska region is Very Low and only Moderate in the Pacific region is made without any legitimate substantiation.

19.11

Another area not addressed is the importance of prey disturbances to the cumulative impacts on migratory species. For example, herring and anchovy, which were not included in the SEIS, are highly vulnerable to OCS activities and provide a critical prey base to numerous migratory fish, bird and mammal species. Impacts to seven species of intertidal organisms were evident over five years after the General M.C. Waig grounded off Cape Flattery, Washington (Clark et al. 1978).

19.12

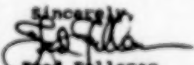
The impacts on the benthic prey of migratory species from routine oil rig discharges should also have been addressed in the SEIS. The U.S. EPA has shown significant adverse impacts from platform discharges up to two miles from drilling sites (EPA 440/4-85/002). The significance of benthic prey to migratory gray whales deserves special consideration, given the surprisingly "Low" ranking afforded this high encounter species.

Finally, the SEIS states that, "The use of airguns is prevalent and is relatively harmless to fish (IV-8)." This assertion is supported by making reference to studies over 15 years old, and ignores the contradictory findings of NMFS's recently funded research (Pearson et al. 1987). It is apparent that more studies are needed on the use of airguns before such an assertion can be made.

19.13

There is no basis for many of the findings presented in the SEIS because of the lack of data on the distribution and abundance of migratory species in the Washington/Oregon Planning Area. Until the above mentioned omissions in the SEIS are addressed, we believe the Court's December 1988 opinion still holds, "... that allowing the Secretary's analysis to pass muster here would eviscerate NEPA (p.28)."

Thank you for the opportunity to provide these comments.

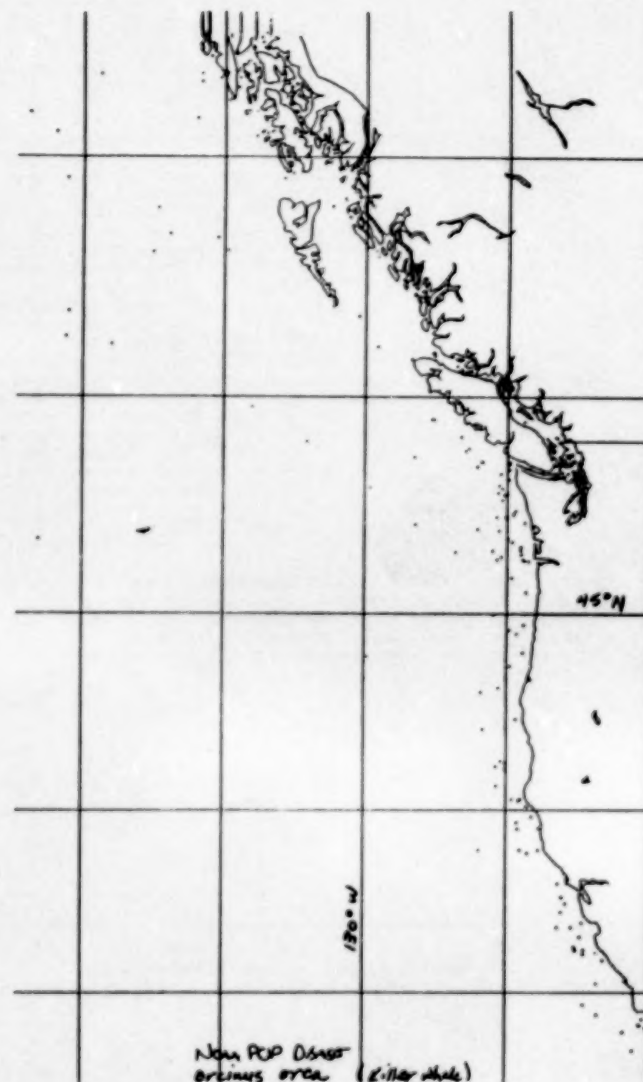
Sincerely,  
  
 Fred Felleman  
 Ocean Issues Coordinator



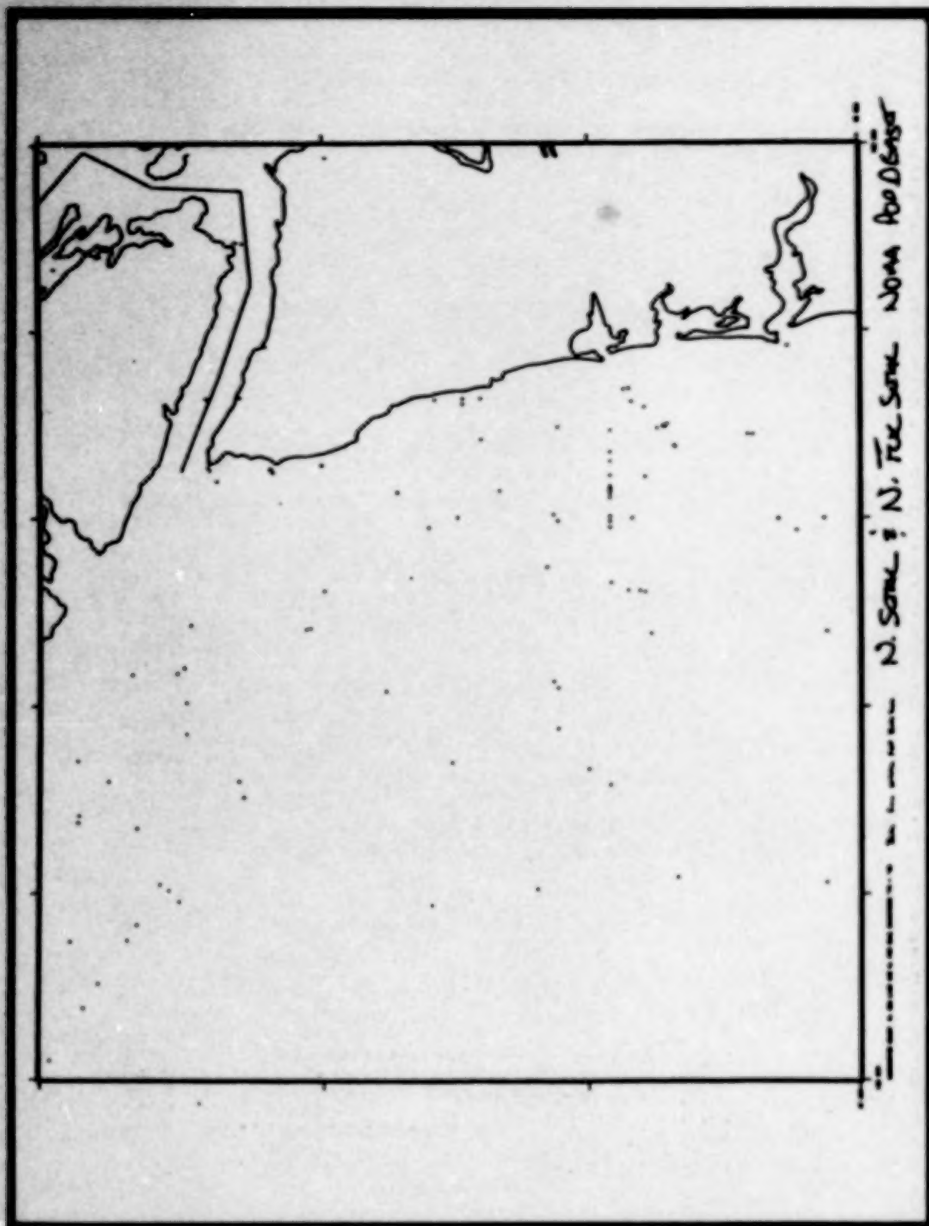
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V89



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V70

TABLE 1. OCCURRENCE DATA OF MARINE MAMMALS AND TURTLES IN THE INTERNATIONAL GILBERT FISHERY OF MARSHALLS AND CHINA

| DATE        | SPECIES                                                        | LOCATION         |
|-------------|----------------------------------------------------------------|------------------|
| <b>1961</b> |                                                                |                  |
| 7-15-61     | Hector Seal, <i>Phoca vitulina</i>                             | 45°30'N 125°30'W |
| 7-25-61     | Hector Seal, <i>Phoca vitulina</i>                             | 45°30'N 125°30'W |
| 8-15-61     | 1 Unidentified porpoise                                        | 45°40'N 125°30'W |
| 8-16-61     | Leathertank turtle                                             | 47°-N 125°-W     |
| <b>1962</b> |                                                                |                  |
| 7-1-62      | Heermann's owl, <i>Bufo marinus</i>                            | 47°3'-N 125°3'-W |
| 7-1-62      | Ball's porpoise, <i>Stenonema balli</i>                        | 45°0'-N 125°0'-W |
| 7-2-62      | Hector porpoise, <i>Stenonema stenocephala</i>                 | 45°31'N 125°37'W |
| 7-2-62      | Pacific white-sided dolphin, <i>Lagenorhynchus obliquidens</i> | 45°13'N 125°39'W |
| 7-2-62      | Ball's porpoise, <i>Stenonema balli</i>                        | 45°34'N 125°31'W |
| <b>1963</b> |                                                                |                  |
| 7-27-63     | Unidentified Turtle                                            | 45°47'N 125°39'W |
| 7-28-63     | Ball's porpoise, <i>Stenonema balli</i>                        | 45°30'N 125°30'W |
| 7-28-63     | Hector porpoise, <i>Stenonema stenocephala</i>                 | 45°30'N 125°30'W |
| 7-28-63     | Hector porpoise, <i>Stenonema stenocephala</i>                 | 45°30'N 125°30'W |
| 7-31-63     | 2 Hector porpoise, <i>Stenonema stenocephala</i>               | 45°41'N 125°35'W |
| 8-05-63     | Hector seal, <i>Phoca vitulina</i>                             | 45°37'N 125°40'W |
| 8-05-63     | Hector seal, <i>Phoca vitulina</i>                             | 45°44'N 125°30'W |
| 8-05-63     | 2 Nihoa's dolphins, <i>Stenonema grisea</i>                    | 45°34'N 125°30'W |
| 8-05-63     | Hector porpoise, <i>Stenonema stenocephala</i>                 | 45°30'N 125°35'W |
| 8-05-63     | Unidentified whale                                             | 45°30'N 125°30'W |
| 8-05-63     | 2 Unidentified turtles                                         | 45°30'N 125°30'W |
| 8-12-63     | Pacific white-sided dolphin, <i>Lagenorhynchus obliquidens</i> | 47°31'N 125°13'W |
| 8-12-63     | Nihoa's dolphin, <i>Stenonema grisea</i>                       | 47°31'N 125°13'W |
| 8-16-63     | Pacific white-sided dolphin, <i>Lagenorhynchus obliquidens</i> | 45°30'N 125°30'W |
| 8-16-63     | Pacific white-sided dolphin, <i>Lagenorhynchus obliquidens</i> | 47°31'N 125°25'W |
| 8-16-63     | Hector porpoise, <i>Stenonema stenocephala</i>                 | 45°11'N 125°41'W |
| 8-17-63     | Ball's porpoise, <i>Stenonema balli</i>                        | 45°45'N 125°34'W |
| 8-17-63     | Pacific white-sided dolphin, <i>Lagenorhynchus obliquidens</i> | 45°13'N 125°40'W |
| 8-17-63     | Unidentified sea lion                                          | 45°13'N 125°40'W |
| 8-23-63     | Pacific white-sided dolphin, <i>Lagenorhynchus obliquidens</i> | 45°30'N 125°34'W |
| 8-23-63     | Heermann's owl, <i>Bufo marinus</i>                            | 45°30'N 125°34'W |
| 8-24-63     | 3 Unidentified turtles                                         | 47°01'N 125°25'W |
| 8-25-63     | Nihoa's dolphin, <i>Stenonema grisea</i>                       | 45°30'N 125°30'W |
| 8-27-63     | Unidentified turtle                                            | 47°34'N 125°36'W |
| 8-28-63     | 4 Unidentified turtles                                         | 47°33'N 125°30'W |
| 8-28-63     | Ball's porpoise, <i>Stenonema balli</i>                        | 47°40'N 125°31'W |



|         |                                                                  |                  |
|---------|------------------------------------------------------------------|------------------|
| 8-20-88 | Dall's porpoise, <i>Phocoena dalli</i>                           | 47°49'N 126°21'W |
| 8-31-88 | Unidentified turtle                                              | 47°11'N 125°11'W |
| 9-01-88 | Pacific white-sided dolphin, <i>Lagenorhynchus obliquidens</i>   | 48°03'N 125°29'W |
| 9-13-88 | J Pacific white-sided dolphin, <i>Lagenorhynchus obliquidens</i> | 46°09'N 126°21'W |
| 9-14-88 | Dall's porpoise, <i>Phocoena dalli</i>                           | 46°16'N 126°33'W |
| 9-14-88 | Unidentified sea lion                                            | 46°16'N 126°33'W |

V71

L10

**COASTAL RESOURCES CENTER**  
P.O. Box 163888  
Sacramento, CA 95818  
916/738-6437

October 17, 1989

Ms. Debra Purvis  
Branch of Environmental Evaluation  
Minerals Management Service  
381 Elden Street  
Berndon, CA 22070

RE: Comments on the Draft Supplemental  
Environmental Impact Statement for the  
8 - year Outer Continental Shelf Oil and  
Gas Leasing Program

Dear Ms. Purvis:

Enclosed are comments from the Coastal Resources Center on the SEIS referenced  
above.

Thank you for the opportunity to review the document and provide MMS with our  
assessment of the document and cumulative impacts of offshore oil and gas  
development on migratory species.

Feel free to contact me with any questions on these comments.

Sincerely,

*Eugenia Laychak*

Eugenia Laychak, Director  
Marine Energy Affairs

Enclosure

Charting a Course for the Future of our Marine Resources

1

Coastal Resource Center Comments on  
Draft Supplemental Environmental Impact Statement  
5 - Year Outer Continental Shelf Oil and Gas Leasing Program

- Pg. I-2 Page I-1 of the SEIS states that the document analyzes cumulative impacts on migratory species that traverse one or more planning area in the Alaska and Pacific Regions. The SEIS eliminates northern anchovy, bonito, jack and Pacific mackerel from the analysis even though they migrate between Alaska and Mexico (bonito and jack mackerel), Oregon and Baja California (Pacific mackerel) and the southern California bight and Monterey Bay (northern anchovy). Migration patterns for thresher shark less well known, although catches have been recorded in central and southern California (NRC, 1987). L10.1
- The SEIS states that these species "are not truly migratory" but does not explain what is meant by that phrase. Please explain and if these species migrate between planning areas, regardless of how their movement compares with the analyzed species, they should be included in the analysis. In addition, ocean shrimp migrate between northern California and southern Oregon, and bocaccio may move north from California into Oregon waters during oil spills (NRC, 1987). Explain why these species were not included in the analysis.
- Pg. IV-4 As of May 15, 1989 the Exxon Valdez spill had spread to contaminate over 700 miles of Alaskan coastline (Alaska Fish and Game, 1989). The statistics given in the SEIS understate the size of the spill and should be changed to accurately reflect the amount of area affected by the spill. L10.2
- Pg. IV-8 In regards to airgun effects on fish, airgun blasts caused a 35% mortality rate in four day old northern anchovy larvae in one study (Halliday, et al, 1987). L10.3
- Demersal fish reacted to airgun blasts by migrating down to the sea bottom or out of the seismic survey areas (Grader, et al, 1989). In addition, rockfish subjected to the blasts gave alarm and startle responses. The SEIS does not cite any reference sources that studied the effects that the exhibited behavioral changes have on feeding, reproductive, or migratory behavior. For example, for fish that migrate out of the seismic survey areas, does this movement affect their ability to spawn? Or if they spawn in unfamiliar areas, would the change in habitat significantly affect the survival rate of the offspring?
- Without further study, the conclusion in the SEIS that airguns are "relatively harmless to fish" is premature and should be changed to reflect the uncertainty that surrounds the study of the effects of the airguns.
- Pg. IV-14 The San Luis Obispo county voter initiative did not disapprove Platform Julia, which was to be constructed in federal waters. Rather, the voters disapproved the onshore facilities that were to transport and process the oil and gas produced from the platform. Currently, Shell is investigating the likelihood of locating the processing facility in northern Santa Barbara County. L10.4

2

Oregon is planning for nearshore mining of gold off its southern shores. This activity should be included in the cumulative analysis. L10.5

The first complete paragraph on this page concludes that logging, placer mining, dredging, and effluent discharges are estimated to be, on a cumulative basis, very low. However no citations for reference sources are given to substantiate this position. Please provide the proper citations.

The last paragraph on this page states that oil spill impacts on salmon have been shown to be very low. However, the third paragraph on the page states that researchers have reported lethal and sublethal responses in salmon from oil and gas. Text on page IV-6 states that spilled oil could have a significant impact on salmon and other anadromous fish. In addition, the seawater soluble fraction of crude oil can have a significant effect on the behavior of coho and chinook salmon and their gills and gill membranes are affected by toxic substances in Prudhoe Bay crude oil (NRC 1987). The evidence suggests that oil spill impacts could be higher than stated on pg. IV-63 and the text should be changed to accurately reflect the findings in the cited studies. L10.6

Information from the California Department of Fish and Game and U.S. Fish and Wildlife Service show that juvenile salmon are already significantly affected by hydroelectric power projects, water diversions, timber and reconstruction projects. The text in the second paragraph under (2) indicates that salmon can be affected by these projects, rather than relaying the fact that fish resources are currently affected by the projects. L10.7

Reduction in onshore salmon habitat has already significantly reduced stocks. The FPMC has closed off the Klamath River Management area to commercial trawling and the Sacramento River winter-run chinook salmon stocks have been declared threatened by the federal government. In addition to habitat, salmon and steelhead stocks have been reduced by warm water releases from Shasta Dam which are lethal to spawning salmon, eggs, and fry. These impacts will continue to occur for generations of salmon and steelhead until habitat is increased and cooler water is released from dams.

In addition, additional water projects may compound these effects. For example, the Department of Water Resources is proposing Delta Water Management Programs that would widen, straighten, and deepen water channels and expand levees to reduce damage from floods. A side effect of these improvements would be increased flows from the Sacramento River to water project pumps that direct water out of the San Francisco Delta to water systems in southern California.

The SEIS seems to indicate that because habitat reductions are not anticipated in the future, long-term changes in salmon populations will not be attributable to changes in habitat. The issue here is two-fold. First, existing water projects, timber operations, and other projects have already caused damage to salmon habitat and stocks that will continue over the next 35 years unless the impacts are mitigated. Second, future proposed projects and operations could exacerbate the problem if they proceed or are inadequately mitigated. Both of these situations will contribute to cumulative impacts regardless of when the projects were and are initiated. L10.8  
L10.9



- Regarding impacts from oil drilling discharges, the SEIS fails to mention recent findings from the Environmental Protection Agency that platform discharges caused adverse benthic impacts up to two miles from drilling sites (Federal Register, 5/24/89).
- Pg. IV-68 The expected levels of cumulative impacts on Pacific Region Salmon should be changed from moderate to very high. Impacts from inland water projects and development have and will cause salmon population declines and significantly lower abundance of the species for more than 10 years. Additional impacts from offshore oil spills, discharges, seismic surveys, and other oil and gas development activities will contribute to these declines and significantly and adversely impact salmon populations.
- Pg. IV-70 See comments for pg. IV-63 and IV-64 regarding salmon habitat and population issues.
- Pg. IV-72 See comments for pg. IV-8 (seismic surveys) and IV-84 (drilling discharges).
- Pg. IV-73 The expected levels of cumulative impacts on Pacific Region Steelhead Trout should be changed from moderate to very high for the same reasons given in comments on pg. IV-68.
- Pg. IV-74 See comments for pg. IV-84 regarding drilling discharges.
- Pg. IV-75 Spilled oil has been known to sink through the water column to the seafloor. Pacific whiting feed on ocean shrimp which are benthopelagic and other species that live on or near the seafloor (NRC 1987). Therefore toxic substances may bioaccumulate in whiting. This issue should be discussed in the SEIS.
- Pg. IV-78 Alternative II should be considered for Pacific Region salmon and steelhead trout given that the cumulative impacts on these species would be very high. Deferral of the central and northern California, Washington/Oregon, and Alaska planning areas that overlie habitat areas should be recommended in the SEIS.

#### REFERENCES

- Alaska Fish and Game, "Exxon Valdez Oil Spill: The First 8 Weeks", Vol. 21, No. 4, July-August 1989.
- Federal Register, "Cordell Bank National Marine Sanctuary Notice of Proposed Rule", Vol. 64, No. 99, May 24, 1999, Pg. 23449.
- Grader, W.F. "Toke" and Eugenio Layrback, "The Effects of Seismic Exploration on Fisheries", American Association for the Advancement of Science, January 19, 1989.
- Halliday, D.V., W.E. Clark, R.E. Piaper, C.F. Greenlaw, The Effects of Airgun Energy Releases on the Eggs, Larvae, and Adults of the Northern Anchovy (Engraulis mordax), Tracer Applied Sciences, January 29, 1987.
- NRC Applied Environmental Sciences, Ecology of Important Fisheries Species Offshore California, January 1987.

L10.10

L10.11

L10.12

L10.13

L10.14

L10.15

L10.16

L10.17

L11

## NUNAM KITLUTSISTI

Protectors of the Land, Inc.  
P.O. Box 2008 • Bethel, Alaska 99509  
907/543-2836

October 18, 1989

Debra Purvis  
Branch of Environmental Evaluation  
Minerals Management Service  
381 Elden Street  
Harrison, VA. 22070

Dear Ms. Purvis:

Per our phone conversation earlier today, I thank you for accepting my comments and input on the SEIS to the 5 year OCS oil and gas leasing program. As I am unfamiliar with actual circumstances off the West Coast of the lower 48 except as noted in response to the FEIS, I address my concerns mainly to the Alaska region discussed within the two documents.

To begin, Nunam Kitlutsisti is a non-profit resource organization in service to the people and villages of Southwest Alaska. The 54 Yup'ik Eskimo and Athabaskan Indian villages in the Yukon-Kuskokwim Delta of southwest Alaska represent the largest concentration of indigenous Native Americans still surviving in the northern hemisphere. Their way of life and local economy is called "subsistence", a mixture of hunting and gathering food for basic survival needs, with a minimal amount of supportive wage labor. They annually harvest approximately 18.4 million pounds of protein in carrying out this life-style. Ninety-nine per cent of that total comes directly from, or is directly dependent upon, the continued bounty and well-being of the marine environments in the Bering Sea.

The thrust to force this program to full implementation without full, due and proper consideration for the benefit of a few profit minded individuals and corporations is irresponsible to say the least. Since petroleum products are in such demand now, how much more valuable they will be in years to come. Corporate entities should be happy to wait 5-10 years when profits will be much higher and development risks can occur in a much more environmentally sound, sensitive, and responsible manner. The existing program carries significant potential for severe negative impacts which may easily result in unnecessary and unjustifiable consequences to the people and wildlife populations of Western Alaska and the Bering Sea.

Since the beginning, our villages, the Congress, and the public at large have been told that the canopy of national environmental laws, arctic operating policy, regulations, monitoring

# NUNAM KITLUTSISTI

requirements, etc., would protect our interests. However, we continue to see these "paper" policies sacrificed when faced with competition for those precious "paper" dollars.

I find several areas lacking in the expressed purpose and intent the BEIS and FEIS documents. The most blatant is the bland/blank statement that "all resources will eventually be developed". Taken in this light and context, addressing "exploratory activities only" is totally insufficient. Both documents are thus contradictory to themselves in that potential impacts as a result of any actual development, are not even addressed.

Mitigation measures as a result of potential development are not discussed. Nowhere in either document does it recognize or discuss the extreme climactic, oceanographic, or isolated conditions that exist as routine occurrences and common knowledge by anyone vaguely familiar with the Bering Sea environments.

The BEIS identifies the northern fur seal as the only migratory species posed any significant risk by potential development; No mention at all can be found of spotted seals, bearded seals, ribbon seals, hair seals, etc. which abound throughout the inter-planning areas. What happened to identification of these species within the document? They are most certainly migratory species as anyone who hunts them for food can readily attest, and must be addressed as such under the lawsuit which mandated the BEIS to take place. They are by far the most commonly utilized and preferred harvest species by those who rely on them for their basic sustenance. This oversight must be rectified before the BEIS document can be considered to have fulfilled its purpose.

Additionally, we now have the (dubious) benefit of the Exxon-Valdez disaster to ascertain actual effectiveness of long-touted response mechanisms to an oil spill by the industry and governmental oversight agencies. We are all sadly familiar with just how satisfactory these turned out to be; and right on the very doorstep of the largest and supposedly best prepared oil-tanker terminal in the United States. How much more devastating it could have been had it happened somewhere out in the remote vastness of the Bering Sea.

The Exxon/Valdez spill is an opportunity for the industry and regulatory entities alike, to take advantage of an unfortunate situation. They must fully assess better response and management techniques and environmental effects, both short and long term, before advocating or allowing further poorly planned developmental activities. They must stop pushing for this development at the expense and disregard of the irreplaceable fisheries, wildlife, human populations, and fragile marine environments of the Bering Sea. Given the insignificant forecasts for economically recoverable petroleum deposits, it is a totally inequitable and irresponsible trade-off.

Taken as a whole, both documents must be revised to consider impacts throughout the complete exploratory, development, and exploitation process, with proper emphasis and identification on the extremely harsh and remote conditions subject to development occurring in or adjacent to Western Alaska. In any other framework they do not begin to satisfactorily address reality.

# NUNAM KITLUTSISTI

The Secretary's only responsible recourse therefore, is to follow his legal and moral (what DOES that word "moral" mean?) obligation in making the determination that changes to the 5 year program are easily warranted, and adopt Alternative III as the preferred action.

In the event that the Secretary finds this most appropriate alternative unmanageable in deference to political pressure and/or special interests, the only other acceptable option is adoption of Alternative II; with the attendant obligatory deferral of all lease sales within the Bering Sea-Alaska OCS, until such time as the plan's inadequacies for the region are thoroughly addressed and mitigated.

Regards,

*Greg Rozicka*  
Greg Rozicka  
Resource Coordinator - N/K

cc- Ak. Congressional Delegation  
Gov. Steve Cowper  
Cenaliulriit CRSA  
Bristol Bay CRSA  
AVCP Inc.  
NARF  
DOI  
EPA  
Sierra Club  
Greenpeace Intl.  
N/K OCS File

### 3. Responses to Comments

#### FEDERAL

##### **F1 U.S. DEPARTMENT OF TRANSPORTATION**

##### **UNITED STATES COAST GUARD**

**F1.1** The comment is noted.

##### **F2 U.S. NUCLEAR REGULATORY COMMISSION**

**F2.1** The comment is noted.

##### **F3 U.S. ENVIRONMENTAL PROTECTION AGENCY**

**F3.1** The comment is addressed in the responses for the following comments: F3.3, F3.4, F3.5, F3.6.

**F3.2** The comment is addressed in the responses for comment F3.7.

**F3.3** The five levels of cumulative impact ("very low" to "very high") provide a reasonable degree of categorization within the spectrum of possible impacts. For consistency and comparison purposes, the definitions used in the SEIS were the same as those used in the FEIS. It is particularly appropriate to use the same definitions in a supplement prepared on remand from the court to correct a deficiency in the original EIS. It must be remembered that the cumulative impact level definitions used in the FEIS had to be appropriate for the entire Nation's offshore area encompassing 21 planning areas and addressing programmatic level decisions required by Section 18 of the OCSLA. Your comment will be taken into consideration during the preparation of the EIS on the next 5-year program.

**F3.4** We do not agree that impacts categorized as less than "high" are dismissed and that additional emphasis needs to be placed on impacts defined as "moderate" in the EIS. Each of the selected migratory species are analyzed fully before a conclusion is reached specifying an estimated impact level for each species. That emphasis is put on resources fitting into the "high" impact level seems appropriate in light of CEQ's regulation (Implementing the Procedural Provisions of NEPA) section 1502.2(b) which states that "Impacts shall be discussed in proportion to their significance."

**F3.5** Not all sublethal effects are automatically categorized as "very low" and in turn, considered insignificant. It is recognized that some sublethal effects may, in fact, affect a population resulting in a change in distribution and/or abundance of the species (e.g., disturbances substantially affecting mating or reproduction) (See Section IV.D.1.c(1) concerning disturbance to the northern fur seal from noise). In such an instance, the appropriate impact level may be "low," "moderate," or more severe in conformance with the definitions for those impact levels (Appendix A).

**F3.6** We agree that an adverse impact to individuals of threatened and endangered species would be more significant than to individuals of nonthreatened and nonendangered species. The present impact level definitions in the SEIS (Appendix A) account for this and do not have to be modified. The severity of impact, as presented in the definitions, is based on changes to the population level. A population of threatened and endangered species is likely to be more severely affected (changed) when individuals are affected (due to limited number of individuals) than in the case of the



nonendangered and nonthreatened species. In turn, the same adverse effect on those individuals (endangered and threatened species) is more likely to change the population and result in a higher impact level than in the case of effects on individuals of nonthreatened and nonendangered species.

The measurement of the severity of an impact should not be confused with the sensitivity of the resource to impact causing activities. Because endangered species are usually more sensitive than non-endangered species, a given activity (or activities) will most often result in a more severe overall impact for an endangered species than a non-endangered species. For example, a given activity may cause a low impact to a non-endangered species but a moderate impact to an endangered species (See Section IV.D.2.a(4) and IV.d.2.b(5)). This does not mean, however, that the moderate and high impacts are defined differently for each endangered species.

- F3.7** The term "existing" as presented in the draft EIS is somewhat a misnomer. Existing impacts include those associated with past and ongoing OCS activities, and past, ongoing, and future non-OCS activities. Although the label attached to this combination of activities may not seem appropriate, the intention is to provide a basis for assessing whether current and future OCS programs are expected to contribute in a substantive way to the "cumulative" impacts on a migratory species.

For a given type of migratory species (e.g., cetaceans), the impact levels for existing activities or cumulative activities are established in the same manner. The effects from each set of activities are evaluated and compared with the criteria incorporated into the various impact level definitions for that species. In those cases where the level of impact associated with cumulative activities is assessed to be of the same level as the level for existing activities, the analysis indicates that the level of cumulative impact would be the same with or without current and future program activities. Although, in some instances, statements in the SEIS may give the impression that only an additive process was used to determine the cumulative effects, the method of analysis did consider synergistic effects. A detailed discussion on the analytical method used in the SEIS is contained in Section I.B.3.

The SEIS has been modified to eliminate any perceived ambiguity with respect to use of the phrase "the current existing levels" by replacing it with the phrase "the levels associated with past, ongoing and projected non-OCS activities, and past and ongoing OCS activities."

**F3A U.S. ENVIRONMENTAL PROTECTION AGENCY - ATTACHMENT**

- F3A.1** Although the descriptions of the type and levels of impact for each species are general and qualitative in nature, the level of detail is sufficient for the Secretary to make a decision at the programmatic stage. The purpose of this document is to supplement the cumulative analysis in the FEIS and to provide sufficient information to the Secretary as the result of the analysis to make revisions to the overall oil and gas leasing program, if necessary.

The cumulative analysis is based on general assumptions concerning the size, timing, and location of a leasing activity on the OCS. If a decision is made to schedule a lease sale in a particular planning area, a much more detailed analysis will be performed. At each stage in the process, more specific information will be available, thereby allowing for more quantification of the types and levels of impact. Also see response to comment F3.7.

- F3A.2** Section IV.C.1.a of the SEIS has been revised as suggested.
- F3A.3** Section IV.C.1.b of the SEIS has been revised, as suggested.
- F3A.4** Section IV.C.8.e of the SEIS has been revised, as suggested to include references to Lease Sales 97 and 109. However, the infrastructure required to develop the amount of oil and gas resources as a result of Lease Sales 97 and 109 is incorporated in the exploration and development scenario for the cumulative case.
- F3A.5** As a result of water column sampling done by Batelle Northwest in June and September 1989 for the Minerals Management Service, it was found that the ambient concentrations of mercury off the coast of Nome did not exceed the EPA chronic marine criterion. Therefore, the statement concerning ambient water quality conditions has been deleted.
- F3A.6** Information to support the statement concerning the behavioral response of bowhead whales to development and production noise in the confined spring lead system was incorporated by reference from the FEIS for the Chukchi Sea Oil and Gas Lease Sale 109, pages IV-B-80 to IV-B-82. Miles et al. (1986) concluded that both whale species (bowhead and gray) responded to noise sources at about the same received level. Gray whales show little avoidance of production-platform noise. In absence of specific studies on the impacts to the bowhead whale, it is reasonable to assume that the bowhead whale would react similarly to a closely related species (e.g., gray whale).
- F3A.7** The basis for the statement is contained in George et al. (1989).
- F3A.8** Based upon the characteristics and interaction of oil and ice in a lead system and the migration pattern of the bowhead whale, it is reasonable to assume that only a few individuals would likely be exposed to the oil several hours to several days.
- A detailed description of the bowhead whales' migration patterns and periods of migration is contained in Sections III.B.1.a and IV.D.1.a(1). This information was taken into consideration in the impact analysis. A more detailed analysis was incorporated by reference from the discussion on bowhead whales on pages IV-B-78 to IV-B-82 of the Chukchi Sea Oil and Gas Lease Sale 109 FEIS (DOI, MMS, 1987b).
- F3A.9** The SEIS was revised to clarify the basis for the conclusion. See Section IV.D.1.a(2).
- F3A.10** Differences in response appear to be more dependent on whether the individual whale perceives the stimulus as threatening, and to some extent on the current activity of the whale (e.g., socializing versus singular activity). However, based on the many MMS-funded studies conducted to determine the effects of OCS-related noise on humpback, gray, and bowhead whales (see the discussions on these species), there appears to be no evidence that these three species behave significantly different from each other when exposed to industrial noise. Based on existing studies on the gray, humpback, and bowhead whales, it is reasonable to assume that the fin, right, sei, and sperm whales would react similarly to these closely related species.
- F3A.11** Section IV.D.1.b(3) of the SEIS has been revised as suggested.
- F3A.12** This comment is addressed in the response to comment F3A.5. The new water quality information from Batelle Northwest's sampling in June and September 1989 does not alter the conclusion for the Arctic Peregrine Falcon.

**F3A.13** Section IV.E.2.b of the SEIS has been revised, as suggested.

**F4 U.S. DEPARTMENT OF STATE**

**F4.1** The comment is noted.

**F5 NANCY PELOSI, MEMBER OF CONGRESS**

**F5.1** The comments are noted.

**F5.2** The potential effects of large spills from tankers and platforms, as well as the effects of small spills, are considered in the SEIS. The SEIS does not include a review per se of past tanker and platform spills. However, the analysis of spill effects in the SEIS is based on current knowledge of past oil spill and Section IV.A.4 of the 5-year program FEIS contains a detailed discussion of the effects of oil spills and references numerous specific large spills.

**F5.3** The status of the seabird populations since the *Puerto Rican* tanker spill was taken into consideration during the impact analysis of seabirds.

**F6 MARINE MAMMAL COMMISSION**

**F6.1** The SEIS was prepared in compliance with the directive of the court on the adequacy of the cumulative analysis on migratory species in the Alaska and Pacific OCS Regions. The analysis, therefore, focuses only on the cumulative impacts of OCS and non-OCS activities on migratory species in those regions. Although the regional scope of the SEIS is confined to the Alaska and Pacific OCS Regions, the cumulative impact analysis in the EIS for the next 5-year program will consider the effects of the leasing program on migratory species in all OCS areas including the Atlantic and Gulf of Mexico Regions.

**F6.2** There are hundreds of migratory species that could have been evaluated individually in the SEIS. However, many of these species have enough in common with respect to population status, migratory pathways, and sensitivity to program and nonprogram activities that they were grouped to eliminate presentation of redundant analysis. The principal criteria used in selecting species that are evaluated in the EIS were: 1) have issues been raised through the EIS scoping process related to the species, 2) could the species be affected in any substantive way by activities associated with the current OCS program (i.e., the proposal), 3) does the species migrate (i.e., exhibit a predictable cycle of movement from one area to another that is repeated over many generations) through more than one planning area or region, and 4) is the species representative of a larger group that would likely be affected in similar ways? The application of these criteria provided a good basis for limiting the numbers of species analyzed in the EIS without omitting essential information (See Section I.B.2).

Additional species requested for inclusion in the final SEIS were evaluated based on the criteria listed above (See Section I.B.2). Based on this evaluation, the following species have been added to the document: bald eagle, walrus, and the ribbon, spotted, bearded, and ringed seals.

**F6.3** With respect to the treatment of small cetaceans that are subject to frequent incidental take, refer to the analysis of impacts on harbor porpoise. Incidental take of this species by commercial fishing is reviewed in detail. We recognize that other species of small cetaceans may be taken in greater numbers by commercial fishermen, but



these species tend to be pelagic by nature and not likely to be affected in a substantive way by the OCS program. However, the harbor porpoise is the more common of the small cetaceans in the coastal waters of the Pacific and Alaska Regions. Due to their occurrence in coastal habitats they would be most likely to interact with OCS oil and gas activities. Thus, it is appropriate that the harbor porpoise be selected for evaluation in the SEIS as a species representative of small cetaceans. Also see discussion in Section I.B.2. on small cetaceans.

- F6.4** As suggested, the SEIS describes a range of impacts considering a variety of conditions. Although there are some "uncertainties" in any environmental impact statement concerning impacts, the analyses of impact producing factors in the SEIS are made on reasonable assumptions concerning the possible exploration, development and production of the oil and gas resources. In many instances, the potential impacts are described if "atypical" conditions or events occurred to give a range of possible impacts. However, the conclusions reflect the analysis which is based on these reasonable assumptions.

Prior to the exploration and production of oil and gas on the OCS, there are several different stages in the leasing and development process which allow for the gathering of information and the development of measures to mitigate potential impacts. All activity on the OCS is conducted under the constraints imposed by MMS regulations and the numerous mitigation requirements of those regulations.

At the programmatic stage, a potential mitigation might be to eliminate areas from consideration. Another method to mitigate effects is the development of operating stipulations during the planning process for individual sales. These stipulations would be attached to specific leases at the lease sale stage. Prior to the approval of an exploration or development plan, modifications can be made to mitigate any potential adverse impacts.

Another source of information to aid in the development of mitigating measures and to monitor the effects of oil and gas operations is MMS's Environmental Studies Program (ESP). The ESP identifies informational needs associated with the impacts on marine biota from oil and gas development. At each subsequent stage of the leasing process, informational needs are constantly defined and refined. Currently, several ongoing studies are gathering information on migratory species and monitoring the effects of oil and gas production.

- F6.5** This comment is addressed in the response to comment F6.1. Also see Section I.B.2 concerning species analyzed in the SEIS.
- F6.6** This comment is addressed in the response to comment F6.4.
- F6.7** This comment is addressed in the response to comment F6.4.
- F6.8** For those species that fall within its scope, the SEIS assesses the cumulative effects of subsistence activities and commercial fishing. For example, pinnipeds which experience impacts from subsistence hunting are represented by the fur seal and Steller sea lion. However, if the species does not migrate between or among planning areas, or is not substantively affected by OCS oil and gas activities, it is not included in the SEIS. The basis for limiting the species analyzed and the criteria used for selecting species analyzed are presented in Section I.B.2.

- F6.9 Information presented in the SEIS does not need to conclude with "certainty precisely what effect" OCS-related noise may have on whales. However, it must and does present sufficient information for the Secretary to evaluate alternatives and make a reasoned choice among alternatives.
- F6.10 Section IV.B.4.d(3) of the SEIS has been revised, as suggested. Also see response to comment F6.11.
- F6.11 The SEIS was prepared in compliance with the directive of the court on the adequacy of the cumulative analysis on migratory species in the Alaska and Pacific OCS Regions. The analysis, therefore, focuses only on the impacts to migratory species. Specific analysis for each prey species was not included. However, we agree, that potential impacts to the migratory species can occur as a result of indirect effects (as an example, reduction in prey species). Potential impacts on many prey species are evaluated in the FEIS for the 5-year program. Where applicable, the cumulative analysis in Section IV.D takes into consideration these indirect impacts (For example, see Section IV.D.3.a).
- F6.12 Goodale et al. (1981) reports that free ranging cetaceans were feeding in oil slicks without any apparent change in behavior. On the basis of this, it is reasonable to conclude that the oil was not threatening to the hundreds of cetaceans that were feeding there. Based on Geraci and St. Aubin (1982, and 1985), it is also apparent that, at most, crude oil has only minor short-term effects on cetacean skin and baleen, and is unlikely to cause mortality due to ingestion or inhalation. The impact conclusions were based on all of the best information available as referenced in the SEIS; not on Goodale et al. (1981) alone. However, the statement in the SEIS does imply that the expected negligible impact on whales is based only on Goodale et al. (1981). Consequently, it has been rewritten to better reflect the basis for the expected negligible impact. Similar wording on page IV-35 has been revised.
- F6.13 Although no specific studies have been conducted on the right whale, there is no reason to expect that this species would behave significantly different from the baleen whale species that have been studied. Studies conducted to date indicate that it is unlikely that cetaceans would be significantly affected by oil spills or noise disturbance. The level of impact expected, therefore, reflects the reaction of the whales with respect to OCS activities and any potential changes in population level.
- F6.14 Section IV.D.1.b(2) of the SEIS has been revised.
- F6.15 The potential cumulative impacts to Steller sea lions throughout their range and in different seasons were discussed. Statements concerning potential impacts on particular species were included so the reader would be aware of the potential consequences of an interaction between biota and adverse factors. However, in each discussion such statements are clarified by specifying the conditions under which these impacts are likely to occur. The conclusions following each discussion are intended to summarize the expected impacts, all information being considered, and not to summarize what might occur in a low probability, worst-case event.
- F6.16 Section IV.D.1.c(5) of the SEIS has been revised.
- F6.17 Section IV.D.1.d of the SEIS has been revised to reflect new information on polar bears.

**F7 NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION**

**F7.1** This comment is addressed in the response to comment F3A.1.

**F7.2** This comment is addressed in the response to comment F3.6.

**F7.3** Based on the criteria listed in Section LB.2 of the SEIS concerning representative or candidate species, it was determined that impacts to this particular stock of salmon would be similar to those experienced by the five species discussed under Pacific Salmon.

**F7.4** The current status and population level of the Steller sea lion are taken into consideration in the cumulative analysis. The fact that the Steller sea lion is being considered for listing as a threatened species is relevant only in that it indicates the population may already be under stress. The impact level definitions take into account the existing condition of a population by assessing the amount of time that may be needed to recover from the impact. See response to comment F3.6.

**F7.5** The criteria used in defining "migratory" as used in the SEIS is explained in Section LB.2.

**F7.6** King crab do not take part in large scale group migrations, do not have distinct migration routes, and are random and noncyclic in their movements. For these reasons, king crab are not considered migratory and are not analyzed in the SEIS. Based on the criteria listed in Section LB.2 of the SEIS, Pacific herring was not analyzed in the SEIS. Although the Pacific herring has a broad geographical distribution which may cover more than one planning area, the Pacific herring migrates at depths (15-25 meters) ranging from coastal to offshore areas. The Pacific herring is also a pelagic species that overwinters in very deep waters. This species is, therefore, not likely to be affected in any substantive way from simultaneous activities associated with the current OCS program.

**F7.7** These species were considered for analysis, but were not included in the SEIS based on a review of the criteria developed for the inclusion of a species. As discussed in Section LB.2, sea turtles were "scoped-out" due to being infrequent visitors to coastal California, since they typically inhabit tropical and subtropical seas.

**F7.8** This comment is addressed in the response to comment F3A.1. A detailed discussion of the analytical method used in the SEIS is contained in Section LB.3. A discussion of alternatives such as "staggering development" to be included for analysis in the SEIS is contained in Section LB.4.

**F7.9** Cumulative impact levels were based on population size, seasonal distribution, stability, sensitivity, reproductive rate, habitat use, probability of interaction with OCS activities, and the likely cumulative effect of such interaction. The importance of each factor varies. For example, the moderate level of impact estimated for the harbor porpoise is based primarily on mortality caused by entanglement in gillnets not "coastal habitat." As with the harbor porpoise, the cumulative impacts to gray whales was based upon the above listed criteria, and not solely on their coastal habitat. For example, existing impacting agents and factors (such as entanglement in gillnets) do not appear to have adverse impacts on the gray whale population rate of growth. It is also predicted that the population would continue to increase and eventually achieve stability in the future. With the incremental impacts of the current and future 5-year programs, impacts to the gray whale are expected to be low. The killer whale was not



included for analysis in the SEIS because it did not meet the criteria outlined in Section I.B.2, also see the response to comment S5.8.

- F7.10 The comment is addressed in the response to comment F6.11.
- F7.11 Section IIL.D.1 of the SEIS has been revised.
- F7.12 Section IIL.D.1 of the SEIS has been revised.
- F7.13 Section IIL.D.1 of the SEIS has been revised.
- F7.14 Section IIL.D.1 of the SEIS has been revised.
- F7.15 Section IIL.D.1 of the SEIS has been revised.
- F7.16 Section IIL.D.3 of the SEIS has been revised.
- F7.17 Section IIL.D.3 of the SEIS has been revised to reflect the concern expressed in the comment.
- F7.18 Section IIL.D.3 of the SEIS has been revised.
- F7.19 Section IIL.D.3 of the SEIS has been revised.
- F7.20 Section IV.B.4.d(3) of the SEIS has been revised.
- F7.21 Section IV.B.4.d(3) of the SEIS has been revised.
- F7.22 Specifics of the Malins, et al. (1978) study concerning the salmon's homing ability are contained in the FEIS for the 5-year program (see Section IV.A.4.d(3) page IV.A.-62) and were incorporated by reference into the SEIS.
- F7.23 For the years 1976-1980, the average pink salmon catch in Washington for non-Indian fisheries was approximately 413,000 fish (PFMC, 1988). In 1979, the pink salmon catch by Indian fisheries in Washington was less than 6,500 fish (PFMC, 1988). The non-Indian pink salmon catch declined to about 228,000 fish in 1981, and then dropped substantially beginning in 1983.
- F7.24 This information was taken from PFMC annual Reviews of Ocean Salmon Fisheries.
- F7.25 We recognize and acknowledge that Indian tribal fisheries occur in the Pacific Northwest. Tribal fishing activities, together with commercial and sport fishing activities, are treated as a collective impacting agent that has in the past, and may in the future, affect the size of salmon and/or steelhead stock. The actual breakdown of the numbers of fish that are landed by various groups of fishermen (i.e., commercial, sport, and tribal Indian) is not as important than the total fishing pressure from all sources combined. This is potentially one of the most important activities affecting the size of anadromous fish populations on an ongoing basis. For this reason, the information provided in Section IV.C.2.b(1), (2) and (3), is meant only to provide some general idea of the magnitude of adult fish mortality caused by fishing activities. This section is not meant to be an exhaustive treatment and review of fish landings from all sources, in all areas, and for all years.
- F7.26 Onshore activities which affect freshwater spawning and rearing habitats are expected to be localized and would tend to affect only small segments of the Statewide salmon

habitat and thereby result in impacts only to localized populations. In addition, as part of the permitting process for many of these onshore activities, impacts to these habitats are mitigated. These factors were taken into account in the analysis to determine the potential impacts to the Statewide salmon populations.

- F7.27 The comment is addressed in the response to comment F7.32.
- F7.28 This document supplements the cumulative analysis contained in the FEIS for the current 5-year program. Information concerning drilling discharges is discussed in Section IV.A.8.a (pages IV.A.-91 to IV.A.-95). The drilling muds can be shunted to the ocean floor or barged to shore if it contains oil. Since salmonid species tend to be in the pelagic zone, interaction with drilling discharges would be rare. Also see response to comment S1.6.
- F7.29 There is an implicit assumption in the comment that the level of impact is a function of the degree of uncertainty associated with a proposal. That is not the case. The impact level is a direct result of the analysis, which is based on an explicit scenario for the proposal and the available scientific information concerning environmental resources. Sufficient information was available about the proposal and affected environment to analyze the potential cumulative impacts on migratory species in a programmatic EIS.
- F7.30 For the purposes of a programmatic EIS, the actual breakdown of the numbers of harvested fish is not as important as the total fishing pressure, which is one of the potentially most important impacting agents affecting salmon stocks. Including specific harvest data from the late 1970's would not improve the precision of the cumulative impact analysis. Also, please see response to comment F7.25 above.
- F7.31 See changes in text concerning future improvements in habitat availability or quality for anadromous species over the next 35 years.
- F7.32 We acknowledge that adult or subadult salmon and/or steelhead could suffer direct mortality or sublethal effects from direct contact with oil; however, we believe that very few adult or subadult fish, relative to the abundance of entire stocks, are likely to come into contact with spills and be adversely affected. As stated in the SEIS, we contend that the more sensitive life-history stages of salmon and steelhead are outmigrating smolts or juveniles, nearshore feeding juveniles, and adults that are beginning to ascend their home rivers to spawn; these life stages are expected to occur primarily in those planning areas where their home rivers are located.
- F7.33 See changes in text (Section IV.D.3.a(2)) that indicate potential effects may occur for periods in excess of 1-5 years.
- F7.34 Section IV.D.3.a(2) of the SEIS has been revised.
- F7.35 This comment is addressed in the response to comment F7.32.
- F7.36 Section IV.D.3.a(2) of the SEIS has been revised.
- F7.37 This comment is addressed in the response to comment F7.32.
- F7.38 See changes in text (Section IV.D.3.a(2)) that indicate potential effects may occur for periods greater than 5 years.

- F7.39 See changes in text (Section IV.D.3.a(2)) that indicate potential effects may occur for periods greater than 5 years.
- F7.40 The SEIS has been revised; see changes in text (Section IV.D.3.a(2)).
- F7.41 The SEIS has been revised; see changes in text (Section III.B.2.c).
- F7.42 The SEIS has been revised; see changes in text (Section III.B.2.c).
- F7.43 In any type of survey, the ideal sampling size may not always be achieved; however, sufficient data have been collected in this instance. The conclusions drawn about the impacts of noise from oil and gas activities are based on Malme's (1983, 1984, and 1985) studies of gray and humpback whales which involved observations of some 3000, 4800, and 300 whales, respectively.
- F7.44 The referenced sentence has been changed (Section IV.D.1.a(1)) to read "Industry interest ..., which comprise a portion of the bowheads summer range".
- F7.45 A discussion of the potential effects of a large oil spill during bowhead migration through the spring lead system are contained in Section IV.D.1.a. Based on the characteristics and interaction of oil and ice in a lead system and the migratory pattern of the bowhead whale, it is reasonable to conclude that only a few individuals would likely be exposed to the oil for any significant length of time.
- F7.46 Section IV.D.1.a(1) of the SEIS has been revised, as suggested.
- F7.47 Section IV.D.1.a(2) of the SEIS has been revised.
- F7.48 The sentence has been changed to better reflect the most comprehensive studies pertaining to the effect of crude oil on cetaceans.
- F7.49 Section IV.D.1.a(3) of the SEIS has been revised.
- F7.50 Section IV.D.1.b(3) of the SEIS has been revised to clarify that the assumption of negligible impacts was referring to the productivity of the harbour porpoise population.
- F7.51 Although Guadalupe Island is the only known breeding area for the Guadalupe Fur Seal and is downcurrent from the Channel Islands, data associated with oil-spill modeling for Southern California (LaBelle et al., 1983) indicate that it is unlikely an oil spill will contact Guadalupe Island. However, the analysis has been amended to describe potential impacts that may result if such an event did occur.
- F8 U.S. FISH AND WILDLIFE SERVICE**
- F8.1 The comments are addressed in the response for comment F3.3.
- F8.2 This document supplements the cumulative analysis contained in the FEIS for the Proposed 5-Year OCS Oil and Gas Leasing Program, mid-1987 to mid-1992. The regulatory framework associated with this document is contained in the first volume of the original EIS. A discussion of the Marine Mammal Protection Act is contained on page L-1 of the FEIS for the 5-year program.
- F8.3 After reevaluating the criteria for including a migratory species in the cumulative analysis (See Section I.B.2 of the SEIS), the Pacific walrus has been added.



- F8.4** Section IV.D.1.d of the SEIS has been revised based on new information.
- F8.5** Section IV.D.1.d of the SEIS has been revised based on new information.
- F8.6** These comments are addressed in the responses to comments F8.7 to F8.11.
- F8.7** The probability of large oil spill occurrence was not combined directly with the impact level to arrive at a conclusion about the level of impact, as suggested in the comment. Rather, information about oil-spill risk was used as a basis for making reasoned assumptions about oil contacting an environmental resource. The conclusion regarding level of impact is based on the analyst's expectation, given the assumptions about oil spill contact and other activities included in the scenario. In those cases where a conclusion is based on the assumption that oil will not contact the environmental resource, an analysis was included in the SEIS to indicate what the impacts would be if an oil spill contacted resource. That is, all analyses describe the effects of spilled oil on the resource, but not all conclusions reflect an assumption that contact with oil occurred. Although estimates of the probability of large spill occurrence for the various planning areas are presented in the SEIS, estimates of the probability that an oil-related impact will occur are not available.
- F8.8** See responses to comments F6.1.
- F8.9** The statement concerning the potential impact of oil spills on three species of geese along the Alaska Peninsula (pages IV-47, 49, 51 of the draft SEIS) inadvertently incorporated probabilities of an oil spill entering lagoons occupied by these geese during migration from a previous EIS. The oil-spill data available for the SEIS, as well as for the original 5-year program FEIS, did not include any probabilities of oil-spill contact with these resources. The statements have been revised on pages IV-73, 75, 78 to more accurately reflect the assumptions used in the analysis regarding oil-spill contact with the black brant, emperor goose, and cackling Canada geese.
- Statements concerning potential impacts on particular species, such as those noted by the commenter, where high or very high impacts could occur in an area under certain conditions were included so readers would be aware of the potential consequences of an interaction between biota and adverse factors. However, in each discussion such statements are clarified by specifying the conditions under which these impacts are likely to occur. For example, in Section IV.D.2.b(1) "Entry of oil into peninsula lagoons during spring or fall migration periods could have severe consequences for emperor geese.
- The conclusions following each discussion are intended to summarize the expected impacts, all information being considered, not what might occur in a low probability event. In the case of brant, we expect that if a spill occurred and contacted the Alaska Peninsula in the vicinity of Izembek Lagoon in spring or fall, a portion of the brant population probably would be affected and result in a moderate impact.
- F8.10** See Section I.B.2 for a discussion of rationale for combining species with similar characteristics into categories. For migratory birds, we acknowledge that there is some variation within each category with respect to migratory range and habitat used. However, all species placed within a group have common characteristics with respect to migratory patterns, the type of habitat used, and sensitivity to activities associated with the proposal. Impacts have not been averaged. The impact on each potentially affected species was compared with the criteria included in the impact-level

definitions. To the extent that a particular species within a group exhibits an impact that is markedly different from the others, the impacts on that species have been highlighted.

- F8.11 As explained in the response to comment F8.9, potentially adverse impacts, whatever their probability of occurrence, are elaborated so that readers will be aware of the potential consequences of an interaction between a species and an adverse factor. Potentially very high impacts could occur on the tule goose population if contacted by an oil spill just prior to breeding within its very restricted range. However, the conclusions must take into account the best information on the risk of an oil spill and the assumptions used regarding oil-spill contact with the resources and other aspects of the scenario developed for analysis.
- F8.12 For the purpose of this analysis, it was assumed that oil developed in the Chukchi Sea would be transported through overland pipelines to the Trans-Alaskan Pipeline System. The analysis for the various migratory species which would be affected by the current program takes this into consideration. For example, in Section IV.D.2.a(1) potential effects of the development of west to east the pipeline in close proximity to a number of peregrine falcon nesting sites were evaluated.
- F8.13 The hypothetical boundary between Alaska polar bear populations in Section III has been modified for consistency with the analysis on page IV-57.
- F8.14 Citations discussing effects of direct oiling on polar bears have been added to the SEIS. The statement potentially relating polar bears' typical habit of foraging out of water with a lower probability of exposure to an oil spill is mentioned as one of several factors which appear to suggest that this species might experience a lower rate of spill exposure than one that forages in the water, concentrates in numbers at foraging sites, etc. Without an oil spill occurrence in appropriate habitat, it may be difficult to substantiate. Given the relative insensitivity of adult seals to oil, it would seem reasonable to suppose that an oil spill will result mainly in local reduction of pups if contacted by an oiled adult. The statement noted in this comment has been revised to better reflect these considerations.
- F8.15 While low density of polar bears does not necessarily equate to low probability of displacement by disturbance, it is suggestive and gives rise to inference, as discussed in response to comment F8.14. Similar arguments apply to statements where disturbance is likely to result primarily in minor local displacement of polar bears.
- F8.16 Section IV.D.1.d has been revised based on new information.
- F8.17 The possibility that low polar bear densities could result in low numbers of individuals exposed to oil spills or disturbance cannot be excluded on the basis of current information. The potential effects of many factors require further investigation, but sufficient information was available to support the conclusions reached in the SEIS. The magnitude of the future 5-year program is set forth clearly in tables II.B.1-1, II.B.1-2 and IV.B.4-1. While it is not possible at this time to specify in exactly which habitats future oil and gas development will take place, it will occur within presently specified planning area boundaries.
- F8.18 It is recognized that the peregrine falcon has distinct populations and that some birds migrate over the ocean. However, as discussed in the SEIS, it is unlikely that many birds would contact oil or would be significantly affected by OCS activities. Consequently, expected cumulative impacts are expected to be low.

- F8.19 On the basis of the review criteria in Section I.B.2, the Aleutian Canada goose was one of the species not analyzed in the document. It is not reasonable to assume that all conditions necessary for the Aleutian Canada goose to be impacted by a major spill would occur.
- F8.20 Statements concerning potential impacts on particular species, where high impacts could occur in an area under certain conditions, were included so readers would be aware of the potential consequences of an interaction between biota and adverse factors. However, in each discussion such statements are clarified by specifying the conditions under which these impacts are likely to occur. On the other hand, the conclusions which follows each discussion are intended to summarize the impacts resulting from the events which are more likely to occur, not what might occur in a low probability event. For example, it is unlikely that multiple spills would contact a significant proportion of the diving duck habitat along the Alaska and Pacific coastal regions simultaneously. There is even a less likely possibility of multiple spills occurring during a critical migration period, entering a coastal area, and contacting the ducks on water. However, it is more likely that the diving ducks could be contacted by one spill within its migratory range resulting in a moderate impact.
- F8.21 The threat of oil spills to common eiders is potentially greatest prior to and following nesting when they occupy lagoons and nearshore waters, not when they are nesting on the barrier islands of the Beaufort and Chukchi Seas. Although those eiders nesting on the barrier islands may represent a substantial proportion of the population that nests in these areas, they represent a rather small local portion of the North American population.
- F8.22 This comment is addressed in the response to comment F6.2.
- F8.23 Section IV.D.2.b(3) of the SEIS has been revised.
- F8.24 Section IV.D.2.b(3) of the SEIS has been revised.
- F8.25 Section IV.D.2.b(3) of the SEIS has been revised.
- F8.26 Section IV.D.2.b(3) of the SEIS has been revised.
- F8.27 Section IV.D.2.b(3) of the SEIS has been revised.
- F8.28 The decline refers to the "local" population of murre in central California. On an interregional (Alaska/Pacific) or regional level, there are no indications that common murre are declining in numbers.
- F8.29 Mortality from a single event (i.e., oil spill) would be considered in addition to natural mortality. The comparison of losses from oil spills and natural fluctuations was not meant to downplay the effects of oil spills. However, there are natural events which affect local populations resulting in significant natural fluctuations in the overall population. Recovery time as a result of these natural events can give an indication on the potential recovery time necessary for as a result of a local population to recover from the effects of being contacted by an oil spill. Section IV.D.2.b(4) of the SEIS has been revised.
- F8.30 The cumulative analysis considers the potential impacts to local populations. It distinguishes cases where there are impacts to these local populations. In some cases, these impacts are expected to be greater than impacts to the species as a whole. The



analysis takes into consideration the impacts to these local populations and how they affect the overall population of the species. Section IV.D.2.b(4) of the SEIS has been revised to explain recovery time from these impact producing factors.

- F8.31 Section IV.D.1.b(5) of the SEIS has been revised.
- F8.32 See revised text. Loss of breeding habitat is not assumed to be insignificant; it is just not considered the primary impacting factor affecting shorebirds.
- F8.33 See revised text. Also staging areas are considered critical areas (~~see~~ last paragraph in Section IV.D.2.b(5)).
- F8.34 The major impacting factor to shorebirds is from habitat loss. If an oil spill occurred and contacted two of the sensitive shorebird areas, impacts on local shorebird populations would likely be high, but the cumulative impact to the overall population of shorebirds from all sources (both OCS and non-OCS) is expected to be low.
- F8.35 This comment is addressed in response to comment S1.11.
- F8.36 We acknowledge that Arctic cisco is a migratory species. The migratory habits of this species and the potential effects on it from OCS development in the Beaufort Sea were described in the EIS prepared for OCS Lease Sale #97 (MMS, 1987). However, Arctic cisco is not included for analysis in this SEIS because it does not fall within the scope of the document. That is, it is not a migratory species that could be affected by simultaneous development within more than one planning area. Reference Sections I.A and I.B of the EIS for an explanation of the scope of the EIS as it relates to the remand of the U.S. Court of Appeals, and for criteria used to determine whether a species would be included for analysis in the SEIS.
- F8.37 Thank you for your comments and offer of assistance.

## STATE

### S1 STATE OF CALIFORNIA - DEPARTMENT OF JUSTICE

- S1.1 We agree that the cumulative analysis should examine the incremental impacts over the 35- to 40-year life of the 5-year program. As part of the basic assumptions for the cumulative analysis, it was assumed that exploration, development, and production from the Pacific planning areas are estimated to last a total of 35 years, and from the Alaska planning areas, a total of 40 years. Please refer to the basic assumptions contained in the FEIS for the 5-year program, Sections IV.A.1 and IV.A.2 (pages IV.A.-3 to IV.A.-19) and to the basic assumptions listed in Section II.B.1.e of this document.
- S1.2 The requirements of 40 CFR 1502.22 do not apply because the information essential to a reasoned choice among alternatives is available and was used in the preparation of the SEIS. The Council on Environmental Quality regulations implementing NEPA encourage agencies to tier their EISs (40 CFR 1502.20 and 1508.28). In particular, broad EISs should be prepared at the program stage, such as the subject EIS of the 5-year OCS oil and gas program, and more specific EISs should be prepared for subsequent actions, focusing on the issues ripe for decision. The extensive information cited (FEIS for the 5-year program and SEIS Chapter VI References) and used in the SEIS was adequate for decisions at the programmatic level. Additional information is being gathered through the MMS Environmental Studies

Program and will be incorporated into the environmental analyses for subsequent actions resulting from the 5-year program.

- S1.3 The draft SEIS assumed that the estimated mean number of spills for each planning area would occur with a uniform frequency over the next 35 to 40 years. In addition, to take into consideration the court's remand to analyze simultaneous development, an assumption was made to examine the potential impacts to migratory species if two large (greater than 1000 barrels) oil spills would occur in a given year (See Section IV.B.4.a).
- S1.4 The analysis in the SEIS does consider the repeated chronic exposure to these impacting agents. For example, repeated exposure to oil spill is based on the estimated mean number of oil spills per planning area and is assumed to occur with uniform frequency over the life of the proposed program (e.g., 35 to 40 years) (See Section IV.B.4.a and IV.D.3.c).
- S1.5 Whales migrate thousands of miles each year between their summer and winter grounds. The Alaska and Pacific Regions contain over 1,043 million acres. An average platform including a 200- to 1320-foot buffer zone occupies a relatively small surface area (from 8 to 240 acres). The chance of whales encountering multiple platforms during their migration is remote. In addition, OCS industrial noise on all cetaceans studied have been observed to result in minor short-term effects on some individual whales, and no effect on others and therefore would not result in the alteration of the migratory path. In no case have these minor short-term effects been observed to alter the normal migratory corridor of any whale population. No additional information was provided by the commenter which contradicts our analysis.
- S1.6 The periodic discharging of drill muds and cuttings over time was considered in the analysis of cumulative impacts to migratory resources. As discussed in the SEIS (Section IV.D.3.a(2)), the effects of these types of discharges on wide-ranging migratory species are expected to be localized and result in little more than short-term changes in distribution if individuals avoid the discharge plume. Exposure to these discharges is not expected to cause any discernible lethal impact to fish or other migratory species that would result in population reductions. No additional information was provided by the commenter which contradicts our analysis.
- S1.7 The SEIS does provide an analysis of the impacts on migratory species from past, present and reasonable foreseeable future OCS and non-OCS activities. These individual impacting agents and the potential impacts from each agent are discussed separately but not as isolated events. The cumulative impact conclusions for all migratory species are based upon the cumulative, or combined, effects of all factors. The analysis is presented by individual impacting agent so that the relative importance of the various oil-related and non-oil-related factors can be discerned.

To use the analysis of migratory fish as an example, seismic activities and drill muds/cuttings discharges occurring over time do not adversely affect migratory fish resources except to possibly cause minor, localized changes in the distribution of some fish. In contrast, oil spills from platforms, pipelines and tankers are assumed in the analysis to adversely impact migratory fish resources. As a result, the predicted cumulative impacts to these species were, in large measure, the result of oil spills and non-oil associated factors. To reemphasize, the cumulative impact conclusions for each species were based upon a consideration of all potential impacting agents combined. No additional information was provided by the commenter which contradicts our analysis. Also see response to comment S1.8.

- S1.8 At the program stage, there is no basis for making more than general assumptions about the timing and location of activities that may contribute to the cumulative impacts. Section IV.C. describes the timing and location of existing or proposed projects considered in the cumulative analysis. The SEIS does present the types of impacts that could occur from future OCS and non-OCS activities. However, it is neither possible nor necessary to precisely quantify these effects at the program stage. At each subsequent stage of the leasing and development processes, more specific environmental documents will be prepared. The timing and combination of various non-OCS projects and proposal with the specific OCS activity can then be more clearly described, and impacts better quantified. Also see response to comment S1.7.
- S1.9 The general discussion of impacting agents and potential impacts to migratory species was in some cases conditional, or indicated that a range of impacts could potentially occur. However, the cumulative impact conclusions consequences were based upon reasonable assumptions contained in Sections II.B.1.e and II.B.1.f. For example, "Also, peregrines would be affected by a reduction in prey availability, if a large number of birds in the area are contacted by spilled oil and die." We, therefore, disagree that the analysis for the peregrine falcon is solely conditional.
- S1.10 The SEIS details the potential effects of exposing whales to spilled oil. As stated, those effects could range from negligible to lethal for an individual animal, depending upon its age and physical condition. In arriving at a conclusion of cumulative impact for the species, it was also necessary to consider the possible frequency of exposure and number of individuals exposed. Reasonable assumptions were made regarding these parameters taking into consideration species distribution, migration habits, and possible timings and locations of future oil spills. All these factors together form the basis for the conclusion that a "low" cumulative level of impact is expected for the species. It would not be appropriate to base the conclusion on the assumption that whales will experience "35 years of consistent exposure to oil" (as suggested by the comment) because there is no reasonable basis to support such an assumption. Whales have completed successful migrations through the natural oil seeps (which leaks some 100 bbls/day [Wilson et al., 1974] in the Santa Barbara Channel. Currently, the gray whale population has increased steadily (at an estimated 2.5% rate from 1967 to 1980). No additional information was provided by the commenter which contradicts our analysis. Also see response to comment S1.2 on availability of information.
- S1.11 Reliable information on the environmental impacts of the *Exxon Valdez* oil spill is still limited. Although there has been wide coverage in the public press regarding this spill, scientifically credible information available at this time on short- and long-term effects on organisms is rather incomplete. In turn, this available information has limited direct application in the SEIS.

There are two "official" reports which address environmental impacts of the *Exxon Valdez* spill. One is "The *Exxon Valdez* Oil Spill - A Report to the President" issued on May 30, 1989, from the Secretary of the Department of Transportation and the Administrator of the EPA, and prepared by the National Response Team. This report was considered in the SEIS. The other report, yet to be finalized, is the August 1989 draft "State/Federal Natural Resources Assessment Plan for the *Exxon Valdez* Oil Spill" prepared by the Trustee Council in behalf of the State of Alaska and three Federal agencies (Agriculture, Commerce, and Interior). Other studies of the *Exxon Valdez* incident are being undertaken, and other reports will follow. The National Transportation Safety Board, U.S. Coast Guard, State of Alaska, and other



authorities are looking into the spill, and their efforts will eventually provide a more complete picture of the oil spill's causes, effects, and needed followup actions.

The above-mentioned May 1989 and August 1989 reports indicate the early mortality of the vulnerable sea otters and marine birds; however, the more important long-term effects on their populations are, as yet, unknown. The available data to date have not provided substantive information on the effects on fish (e.g., salmon or herring) or on the avoidance, or lack thereof, by vulnerable mammals (e.g., whales and seals) other than the sea otter.

- S1.12 Oil spill cleanup and containment are mentioned in the SEIS (Section IV.B.4.b) and discussed in detail in the FEIS (Section IV.A.4.b). That discussion includes mention of some of the limitations of cleanup and containment efficiency such as those related to sea state.

The recent *Exxon Valdez* tanker spill showed that the capability was not available to effectively contain and clean up such large spills. Because of this, the United States' ability to prevent, contain, and clean up oil spills became a focus of attention. As one resultant action, the Secretary of the Interior directed MMS to review current oil spill planning and response requirements for OCS oil and gas operations. This review has been completed, and recommendations for upgrading oil-spill planning, response requirements, and practices were prepared (MMS Report of the Oil Spill Response Task Force, May 1989). As another action, the National Response Team, under the leadership of the U.S. Coast Guard is conducting a 6-month study of contingency planning related to oil tankering operations. This study is examining the use of worst-case scenarios to ensure realistic planning, the adequacy of equipment and personnel for an effective response, and the importance of well-defined organizational responsibilities.

Although the experience with the *Exxon Valdez* has indicated problems with present cleanup and containment procedures, this does not affect the present impact analysis in the SEIS. The analysis of oil-spill-related impacts in the SEIS (Section IV.D) is not predicated on the basis of oil-spill cleanup and containment occurring. Conclusions on impact are reached in the SEIS without an assumption of any particular oil-spill cleanup or containment effectiveness.

There is no published, scientific information available on the impact of the *Exxon Valdez* oil spill on any component of the marine environment at the date of printing.

- S1.13 An EIS is required to evaluate all "reasonable alternatives," and to "present the environmental impacts of the proposal and the alternatives in comparative form, thus sharply defining the issues and providing a clear basis for choice among options..." (40 CFR 1502.14). An alternative to stagger leasing is presented in Section I.B.4.
- S1.14 It is unclear as to the source of the resource estimates stated in the comment. However, the resource estimates in Table II.B.1-1 and Table II.B.1-2 were evaluated in terms of how they would affect the cumulative impact assessment and the assumptions previously used. In the FEIS and SEIS as a result of the potential production and transportation of oil in the Northern California Planning Area, the estimated mean number of oil spills is 0.69. For the purpose of analysis a conservative approach was taken, it was assumed that one oil spill would occur. When a similar calculation is made using the resource estimates from the NRA for the Northern California Planning Area, the estimated mean number of oil spills is 0.94. Had the new resource

estimates been used, again for purposes of analysis, this value would be rounded-up and 1 oil spill would be assumed to occur.

The number of platforms required to develop the amount of hydrocarbons associated with each assessment is 3. The only difference in the infrastructure for the platforms would be the number of development and production wells required (34 versus 29 per platform). The difference of 5 wells per platform is not of a magnitude great enough to be able to distinguish an incremental change in the overall cumulative impact level. It was determined that the basic assumptions in the FEIS were still valid (see Section II.B.1.d).

As stated by the court in its opinion, different databases and economic analyses are used in resource estimates for the 5-year program and for specific lease sales (Sale 91). Therefore, the inclusion of sale-specific information in a programmatic document might skew the comparative analysis required by the OCSLA.

We maintain that consistency in assumptions and basic analysis procedures between the FEIS and SEIS is paramount in order to be able to compare the analyses results and conclusions between these two documents. The SEIS is, in essence, simply expanding the analysis, in terms of cumulative impacts on migratory species, already conducted in the FEIS. Any change in assumptions or assessment methodology would render the information in both documents no longer comparable and therefore, not appropriate for informed decision making. The information on the different resources (air quality, migratory species, recreation, etc.) must be comparable, so the Secretary can evaluate the impacts associated with each alternative.

- S1.15 It was assumed that the maximum efficient rate of 1.7 million bbls per day for the TAPS would continue for the 35- to 40-year life of the cumulative case scenario. This assumption did not take into consideration declines in production as fields, such as Prudhoe Bay, are depleted. The oil spill risk associated with TAPS was based on that assumption as well as the terminal at Valdez being able to handle four tankers at one time and has an average turnaround time of 24 hours. Although in March 1988, ARCO completed its discovery well of the Point McIntyre Prospect and early estimates for this field place recoverable reserves around 300 MM barrels of oil, it will be several years before this oil is produced. This field and potentially similar fields will help offset current production declines over the next 35- to 30 years. Therefore, the addition of this discovery would not significantly change the cumulative case scenario. Therefore, the conservative approach concerning the production and transportation of oil from the North Slope takes into consideration as field are depleted new field will be discovered to offset the production decline.
- S1.16 The southern sea otter was not included for analysis in the SEIS because it does not meet all the criteria outlined in Section I.B.2. Specifically, the southern sea otter does not "migrate," even though its range encompasses more than one planning area. The potential effects of the 5-year leasing program on the southern sea otter are evaluated, however, in the FEIS for the program (reference FEIS Section IV.B.9.a(4)(f)).
- S1.17 See response to comment S1.6. The SEIS does (for example, Section IV.D.3.a(2)), in fact, discuss the potential effects of drill muds and cuttings discharged over time on migratory species. As discussed in the SEIS, drill muds and cuttings discharges by themselves are expected to have only minimal effects on migratory species and, thus, to contribute little to the predicted cumulative impact of all factors considered in the

analysis. This is consistent with the CEQ regulations which prescribe that impacts be treated in an EIS in proportion to their significance.

- S1.18 Gray whales do very little feeding during migration. See revised text in Section III.B.1.b.
- S1.19 The EPA regulates the discharge of pollutants from all offshore oil and gas activities. All discharges, including drilling muds, cuttings, and formation waters, are controlled by an EPA National Pollutant Discharge Elimination System permit for the purpose of mitigating adverse impacts to the marine environment.
- S1.20 While smaller spills have not been totally disregarded (see Section IV.D.1.b(3)), the oil-spill analysis in the SEIS has focused on larger (1,000 bbl or greater) spills. Smaller spills are usually the result of transferring or lightering operations, occur most often near ports, and often the spill as well as any effects are only short-termed. Ninety-nine percent of these smaller spills are less than or equal to 10 barrels. These spills, while more numerous, are more easily controlled and usually of limited damage potential. Also see Sections IV.B.4.a in the SEIS and IV.A.4.a (pages IV.A.-26) in the FEIS for a discussion the effects of chronic oil spills.
- S1.21 The oil-spill analysis in the SEIS was not confined to large spills of 1,000 barrels but, rather, included spills of 1,000 barrels or greater. Specifically, the estimated mean number of oil spill as a result of tanker activity (domestic, imports, and as a consequence of the cumulative case) is contained in Table IV.B.4-1. This broad category of spill size encompassed the larger, less probable spills, including the very large (240,000 barrel) *Exxon Valdez* spill type occurrence.
- See also response to comment L4.2 regarding probability of oil spills of the *Exxon Valdez* size or greater occurring.
- S1.22 Please see response to comment S1.11 concerning the effects of the *Exxon Valdez* oil spill on migratory fish species.
- S1.23 The effects of a cleanup effort on marine wildlife was considered where it was expected to be a significant impact producing agent. (See discussion on elephant seals in Section IV.D.1.c(5)(a).)
- S1.24 The impact levels are defined in terms of the severity of the effects to a given resource or species. There is no reason to define the level of effect differently when there are multiple causes for the effect (cumulative case) than when there is a single (individual) cause. Although various activities will cause impacts of varying severity, the definition of an impact level is not a function of the number and types of activities causing that impact. An impact level is defined in terms of the overall severity of the effect regardless of whether the impact was caused by a single activity or numerous activities. See also the responses to comments F3.3 and F3.6. Finally, the purpose of this document is to supplement the cumulative analysis in the FEIS based the remand of the court. During the litigation, the commenter did not challenge the definitions used in the analysis and therefore, can not now criticize their use.

## S2 STATE OF CALIFORNIA - DEPARTMENT OF ENVIRONMENTAL AFFAIRS

- S2.1 An assumption in the SEIS states that once exploration, development, and production begin within the planning area, they would last a total of 35 to 40 years at the levels indicated on Table II.B.1-1. Although this exploration and development is based on the different chances of finding oil and gas in each planning area and therefore can



not be directly compared, a conservative approach was taken. The SEIS analysis is based on the understanding that exploration, development, and production activities will take place concurrently at various levels throughout the Pacific and Alaska Regions during a 40-year period. At the program stage, only general assumptions can be made in the EIS (See Sections II.B.1.d and II.B.1.e).

S2.2 The alternative you suggested is addressed in Section I.B.4.

S2.3 As stated in Section II.B.3 of the SEIS, the assumption about future deferrals of planning areas was made for analysis purposes only. Decisions that will be made for future 5-year programs are not known. However, a reasoned assumption about future decisions is needed because the cumulative analysis covers a 30 year period. As long as deferring a planning area from leasing is determined to reduce the level of cumulative impact on a migratory species, it is reasonable to assume that this type of mitigation will be considered by future program decision makers.

As suggested in the comment, future technology or better information may lead to different conclusions about changes in impact levels associated with planning area deferrals. However, there is no basis for making assumptions about such factors at this time.

S2.4 Identification of impact levels provides an indication of the degree to which certain environmental resources may be affected and, in turn, may provide guidance for needed mitigation. However, there is no precise relationship whereby the categorization of an impact (e.g., "low" or "high") automatically leads to a requirement for mitigation. Mitigation concerns other aspects, such as feasibility, effectiveness, public concern, etc.

The expected duration of the effect was used in the impact level definitions as an indicator of the degree of impact. The duration part of the definitions has two measures. One is relative to the biological resource category—generations. The other is absolute—number of years. This dual scheme for assessing the expected duration of possible effects allows for the highly variable lengths of time between generations across the biological resource categories. The use of the two measures allowed for the variability in generation time among different organisms, yet did not represent an inconsistent methodology in that, for each analysis, the smaller of the measures, generations or years, was used. The SEIS was reviewed and changes were made where it was not clear as to which measure was employed by the analyst.

See also response to comment F3.6.

S2.5 The mitigation referred to in the SEIS relates to restrictions on coastal development in least tern nesting areas. Given that the U.S. Fish and Wildlife Service has a least tern recovery plan in place, it is reasonable to assume that these types of mitigation will continue to be used in the future. The high level of cumulative impact identified in the SEIS results primarily from the assumption that a large oil spill will occur and contact least tern nesting habitat sometime within the next 35 years. The cause of such a spill may or may not be OCS related. The MMS estimates indicate that there may be almost as many large oil spills in the southern California bight from non-OCS sources from as OCS sources (reference Table IV.B.4-2), and that less than one of three large spills is likely to be associated with the current and future 5-year programs. Regardless of cause, the best way to mitigate potential impacts on the California least tern is to reduce the risk of oil-spill occurrence.

Several basic options should be considered to lower oil-spill risks to nesting California least terns. First, reduce oil consumption in southern California. Second, discontinue using the waters of the southern California bight as a transportation route for oil that is not needed for consumption in the area. Third, use sources of oil that pose less risk of large spills than tankers (onshore oil and marine pipelines are examples). Also neither of the first two options can be adopted or imposed by the Department of the Interior. The third measure could be partially implemented by encouraging the development of nearby OCS oil resources that can be transported to shore by pipeline.

- S2.6 The draft SEIS clearly states on page IV-65 that the 21 oil spills are estimated to occur over the next 35 years in southern and central California, Oregon and Washington, and the Gulf of Alaska (from both existing oil and gas activities and tankers), not just southern California. This estimated total number of spills is for existing and/or approved activities only, and does not consider the proposed 5-year program or future activities. The 12 oil spills that are discussed on page IV-43 of the draft SEIS refer to the total number of spills estimated to occur in southern California from all sources, and consider existing, approved, and future activities.

The total of three oil spills estimated to occur in central California on page IV-65 (5th full paragraph) of the draft SEIS considers only the existing and approved oil and gas activities. On the top of page IV-43, the draft SEIS states that three spills are estimated to occur in central California from existing and approved activities, but with the inclusion of the current and future 5-year programs, the estimated total number of spills increases to four.

- S2.7 Since the document is supplementing the FEIS for an existing program, the preferred alternative is the one adopted by the Secretary of the Interior on July 2, 1987.
- S2.8 Please refer to responses to comment letter S2A.
- S2.9 Please refer to responses to comment letter S2B.
- S2.10 Please refer to responses to comment letter S2C.
- S2.11 Please refer to responses to comment letter S2D.
- S2.12 Please refer to responses to comment letter S2E.
- S2.13 Please refer to responses to comment letter S2F.

**S2A CALIFORNIA DEPARTMENT OF PARKS AND RECREATION**

- S2A.1 The court directed MMS to evaluate the effects of simultaneous interregional OCS development (reference Section LA of the SEIS). Assumptions had to be made about activities associated with that development in order to provide a reasonable basis for analysis. The occurrence of large oil spills (i.e., greater than 1000 bbl) is one of those assumptions. The number of oil spills that is assumed to occur within a region is based on estimates of OCS oil and gas resources for the region and estimated oil tanker traffic within or through the region. There is no basis for projecting the locations within a planning area that the assumed oil spills would occur. Thus, there is no basis for assuming that more than one of the assumed spills would occur at the same place, such as an island. This approach is consistent with the court's directive in that simultaneous development (including possible accidents) be

evaluated, even though it is not possible to project the timing and location of each assumed spill within a region.

- S2A.2** The explanation of the oil spill assumptions used in the analyses of cumulative effects on migratory species in the draft SEIS is located on page IV-4 of the draft SEIS. In the impact analysis, it was assumed that the estimated mean number of spills for each planning area would occur with a uniform frequency over the next 35 to 40 years. In addition, the SEIS examines the potential impacts to migratory species based on the assumption that two large (greater than 1000 bbl) oil spills would occur in a given year. These assumptions were used to address the cumulative effect of multiple oil spills on a migratory species and/or its critical life history areas.

For example, from Table IV.B.4-2 in the SEIS 12 oil spills are estimated to occur from all sources in southern California, and 13 oil spills are estimated for Navarin over a period of 35 to 40 years. Assuming an even distribution of spills over time, this would amount to about one spill every 3 years in both planning areas which could affect migratory species. These assumptions, along with potential spills in the other planning areas, were used to address cumulative effects of multiple oil spills on a migratory species and/or critical life history areas.

**S2B CALIFORNIA DEPARTMENT OF WATER RESOURCES**

- S2B.1** Your comment is addressed in the response to comment S1.21.
- S2B.2** Your comment is addressed in the response to comment S1.12 concerning the effects of the *Exxon Valdez* oil spill on fish resources including salmon.
- S2B.3** We agree that potential impacts to the migratory species can occur as a result of indirect effects (as an example, reduction in prey species). The cumulative analysis in Section IV.D takes into consideration these indirect impacts. Also see response to comment F6.11.

**S2C CALIFORNIA WATER RESOURCES CONTROL BOARD**

- S2C.1** Your comment is noted.

**S2D COUNTY OF SANTA CRUZ**

- S2D.1** Please refer to responses to attachment 2D1.
- S2D.2** Your comment is noted.

**S2D1 COUNTY OF SANTA CRUZ (ATTACHMENT 1)**

- S2D1.1** The 1987 Program defers subareas within 13 planning areas (See Section II.A.2 in the FEIS pages II.-48 to II.-72) and highlight other subareas with 7 planning areas for special consideration during the pre-sale process to protect "environmentally sensitive" areas. Also see Section I.B.4.
- S2D1.2** This comment is addressed in the response to comment F3.3.
- S2D1.3** This comment is addressed in the response to comment S2.4.
- S2D1.4** This comment is addressed in the response for comment F3.6.



- S2D1.5 This comment is addressed in the response for comment F3.6.
- S2D1.6 This comment is addressed in the response for comment F3.3. We will consider this point as we examine the definitions for the next 5-year program EIS.
- S2D1.7 This comment is addressed in the response for comments S2D1.8 to S2D1.12.
- S2D1.8 The Pacific mackerel was scoped out of the SEIS analysis since the coastwide movements of this species are relatively limited, and oil and gas activities, including oil spills, were not expected to significantly contribute to the overall potential cumulative effects on the species. Thus, this species does not meet the criteria outlined in Section I.B.2 which explains the basis for selecting species included for analysis in the SEIS.

As discussed in this comment, and further discussed in MBC (1987), the Pacific mackerel is a pelagic species that exhibits coastwide movements, largely between the Southern and Central California Planning Areas, and spawns primarily in the Southern California Planning Area. Available information from the California Department of Fish and Game (annual CalCOFI reports in 1986, 1987, and 1988) suggests that the spawning biomass of the Pacific mackerel has been increasing in recent years and that the stock is presently in good condition. In the past, however, the Pacific mackerel was considered to be in a depleted state as the result of excessive commercial fishing pressure combined with weak year classes.

Oil and gas activities that could potentially affect the various life history stages of Pacific mackerel are the same as those considered for salmon, steelhead, and Pacific whiting in the SEIS. These include seismic survey activities, discharged drill muds and cuttings, and accidental oil spills from a variety of sources. Impacts to Pacific mackerel from seismic surveys and drilling discharges are expected to be localized and short term, and generally comparable to that described for Pacific whiting in the SEIS (see Section IV.D.3.d). As for Pacific whiting and other fish species with pelagic eggs and larvae, the eggs and larvae of Pacific mackerel are expected to be most sensitive and potentially vulnerable to oil spills. Although some eggs and larvae of Pacific mackerel may be adversely impacted by oil spills estimated to occur in the Southern California Planning Area, this species spawns over a large geographic area, and these life history stages occur over a relatively wide depth range in the water column. For these reasons, individual oil spills are unlikely to contact and impact a significant portion of the Pacific mackerel eggs and larvae produced by the adult stock in a given season.

As discussed above, the major factors that are expected to affect Pacific mackerel occurring offshore California include natural fluctuations in abundance resulting from variable year class strength, and adult mortality resulting from commercial fishing pressure and possibly predation. As noted above, these factors have historically resulted in the depletion of the Pacific mackerel stock offshore southern and central California. These factors, rather than oil- and gas-related activities, such as seismic surveys, the discharge of drill muds and cuttings, and oil spills, are expected to be the major determinants of Pacific mackerel abundance in southern and central California.

- S2D1.9 The comment is noted.
- S2D1.10 The comment is noted.

**S2D1.11** This comment is addressed in the response to comment S2D1.8.

**S2D1.12** Shearwaters, phalaropes, and alcids were chosen as representative of the millions of seabirds in the Alaskan and Pacific Regions because they constitute the majority of the breeding and migrating seabirds in the two Regions. The alcids are intended as representatives of the seabirds (including the storm petrels, gulls, and cormorants) in the two Regions.

**S2D1.13** Only those aspects of the species' life history that could be impacted by oil and gas activities or were known to be experiencing other cumulative impacts were included in Sections III.B through III.D of the SEIS.

**S2D1.14** The impacts of oil spills on prey species were considered where it was felt it could result in an impact to the species. This is especially true for species that are known to concentrate at regular feeding areas (e.g., gray whales - Section IV.D.1.a(2), brown pelicans - Section IV.D.2.a(4), and seabirds - Section IV.D.2.b(4)). Where applicable, the SEIS has been revised.

**S2D1.15** Section IV.D.3.d of the SEIS has been revised.

**S2D1.16** The comment is noted.

**S2D2 COUNTY OF SANTA CRUZ (ATTACHMENT 2)**

**S2D2.1** The resolution is acknowledged.

**S2E CITY OF CARLSBAD**

**S2E.1** The comments concerning the SEIS are noted. However, the SEIS is being prepared in compliance with the court's opinion on the adequacy of the cumulative analysis on migratory species in the Alaska and Pacific OCS Regions. The analysis, therefore, focuses only on the cumulative impacts of OCS and non-OCS activities on migratory species in those Regions. Your comments and concerns will be taken into consideration during the preparation of the EIS for the next 5-year program.

**S2F COUNTY OF SAN DIEGO**

**S2F.1** Those aspects of the life history of least terns relevant to the analysis of oil and gas activities and other impacts appear in Sections III.C.1.c. and IV.D.2(3) in the SEIS, and in Sections III.C.3.a(6) and III.C.4.a(6) in the FEIS. The recovery or recovery efforts of endangered species were included in discussions where they affected or could affect the status of the species over the life of the project (e.g., gray whales and brown pelicans). Least terns are expected to, at best, maintain their current depressed population levels throughout the life of the project.

**S2F.2** Section IV.D.2.a(3) of the SEIS has been revised.

**S2F.3** The comment is noted.

**S3 STATE OF CALIFORNIA - CALIFORNIA COASTAL COMMISSION**

**S3.1** The conclusions presented after each analysis represent the MMS assessment of the impact level resulting from all the activities described in the cumulative activity scenario. These includes assumptions about activities including oil spills from current and future OCS leasing programs as well as the other activities (including non-OCS

activities) listed in Section IV.C of the SEIS. For example, the analysis of impacts on the California least tern describes the impacts from existing and future non-OCS related development to be of a moderate level. The conclusion, however, indicates that the cumulative impact on this species is expected to be of a high level. This difference in the level of impact is attributed to the addition of the assumed current and future OCS program activities to existing activities and assumed future non-OCS activities, such as coastal development. Also, see responses to comments S1.4 and S1.7.

- S3.2 We recognize that the cumulative effect on a migratory species may be greater than the sum of the effects caused by each activity included in the scenario evaluated. The impact levels presented in the conclusions of Section IV of the SEIS reflect the level of synergistic impact expected when all the activities in the cumulative scenario are considered individually and collectively. Refer to Section I.B.3 of the SEIS for a discussion of analytical methods used.
- S3.3 This comment is addressed in the response to comment S1.11.
- S3.4 This comment is addressed in the response for comment L4.1.
- S3.5 The regulations of CEQ implementing NEPA clearly do not require a worst-case analysis for this document.

Furthermore, it should be noted that the scenario for the SEIS analysis includes assumptions that represent in several respects a "worst case" condition (see SEIS, pages II-1 to II-3). For example, the resource estimates used for the cumulative case scenario represent an estimate of the total leased and unleased resources, and the total developed and undeveloped reserves, in each planning area. In addition, in compliance with the court's remand, simultaneous interregional development is assumed for purposes of analysis. As explained in Chapter II, these assumptions are highly unlikely and represent higher levels of resource discovery and much greater production activity than is likely to occur.

- S3.6 The rationale for using the particular impact level definitions in the SEIS, which are the same as those used for the FEIS, is provided in the response for comment F3.3. Further, specificity in the definitions, such as consideration of percent of regional and local population affected, is not necessary and more appropriate to specific lease sale EIS's.
- S3.7 A given decline in a population of threatened or endangered species is more serious than in a non-endangered/threatened species and is accounted for in the impact level definitions since the final measure of effect is on the distribution and/or abundance of the species. By the definitions in the SEIS, the same level (percentage) of population decline will result in a more severe effect on the already limited endangered/threatened species than one that is not. Please refer to the response for comment F3.6 for additional information.
- S3.8 It is correct that the impact level definitions do not directly reflect sublethal effects such as morbidity or relocation of a population. However, such sublethal effects are accounted for when they are substantial enough to result in population decline which, in turn, is used in measuring impact. See also response to comment F3.5.
- S3.9 For each migratory species, the effects of specific nonoil-related and oil-related impacting agents or activities were individually analyzed, and the potential impacts



characterized. To the extent possible, the impacts for each agent were characterized in terms of the impact level definitions found in Appendix A of the SEIS and then combined to reach a cumulative impact conclusion regarding the species. In the case of oil-related impacting agents, for example, the cumulative effects of seismic surveys, drilling discharges, and oil spills were analyzed for each fish species. These analyses concluded that both seismic surveys and drilling discharges would be expected to cause only temporary changes in fish distribution or abundance, but not cause any discernible lethal or sublethal effects that would affect the abundance of any species. The overall cumulative level of impact from these two impacting agents would be characterized as very low based on the impact level definitions found in Appendix A. The impacts of oil spills on the sensitive life history stages of each species were evaluated based on a specific number of estimated oil spills and scenarios. In the case of salmon and steelhead, for example, oil spills were concluded to potentially cause population effects that would last from 3-5 years. This impact would be characterized as moderate based on the impact level definitions found in Appendix A. Following these analyses, the combined impact levels of all factors, both nonoil- and oil-related, were considered together to reach a specific impact cumulative impact level for each species. In the case of salmon and steelhead, for example, the individual impacts of seismic surveys and drilling discharges were so low that even when combined with moderate oil-spill impacts the overall cumulative impact remained moderate.

- S3.10 The comment is addressed in Section I.B.4 concerning alternative to be analyzed in the SEIS.
- S3.11 The SEIS has been revised to present a comparison of alternatives. However, the SEIS is not the proper document to discuss the reasons for the course of action the Secretary decided upon. Prior to the Secretary's decision, a record is prepared in compliance with 40 CFR 1505.2 identifying all alternatives considered and considerations which were reviewed and balanced while making his decision.
- S3.12 The Poisson distribution indicates the estimated frequency of a certain event occurring within a given exposure interval, in this case, the number of oil spills (1,000 bbl or greater in size) within the production of oil over the lease sale's lifetime. Use of the Poisson distribution does not assume or provide any implication as to when during the interval the event(s) are likely to occur.

The Poisson parameter MMS utilizes is a function of the historic spill rate (spills observed per billions of barrels of oil handled) and the estimated volume of oil to be produced over the lease sale's lifetime. The data upon which the spill rate is based, historic spills of 1,000 bbls and greater, indicate that such spills occur in all seasons. There have not been enough OCS spills of such magnitude to support rigorous statistical analyses of the likelihood of such a spill to occur within a particular season of a particular year of production. (No OCS spills of this magnitude have occurred as a result of exploration activities, for example.)

Given no statistical evidence to support the assumption that such spills are more likely to occur during a particular season or a specific phase of production, the uniform distribution was applied. This simply means that MMS assumes that spills are likely to occur equally on any given day within the lease sale's lifetime.

- S3.13 Since oil spills occur randomly, any number of potential spill distributions could possibly occur over time for a situation where multiple oil spills occur in a given area. In order to focus the analysis of oil-spill impacts in the SEIS, it was necessary to utilize one specific spill distribution for all planning areas and species. Oil spills distributed

near even or uniform over time was selected rather than one based on an arbitrary distribution for each planning area. Also, see response to comment S3.12.

The frequency of oil spills in Pacific Region Planning Areas was based on the total estimated number of spills, and the assumption of an even or uniform spill distribution over the 35-year period considered in the analysis. It is true that cumulative impacts to Pacific Region salmon, California brown pelicans, and seabirds populations were found to be moderate, in part because of this spill frequency. This spill frequency, however, was based on clearly stated assumptions that are not unreasonable. Finally, the SEIS acknowledges that the magnitude of impact on these species is highly variable and related to the degree of oil contamination.

- S3.14 Section IV.D.1.b(3) of the SEIS has been revised.
- S3.15 Section IV.D.1.c(2) was revised to clarify the basis for the high impact to the northern fur seal.
- S3.16 Only certain portions of the Steller sea lion population are declining. The SEIS analyzes impacts to the entire North Pacific population. Based on that analysis, the potential impacts were expected to be moderate.
- S3.17 The cumulative impact conclusion made by the analyst was based on what is known about the species life history, the potential impacting agents, and the impacts that these agents have on the species. The conclusion reached for brown pelicans is based on the population level of pelicans, their distribution, their vulnerability (or invulnerability) to identified impacting agents, the probability that their habitat would experience impacts, and their ability to recover from drastic population declines. The conclusion reached for the least tern is similarly based on the species low population level, their vulnerability to identified impacting agents, their seasonal distribution in the planning area, and the probability that their habitat would be impacted.
- S3.18 Section IV.D.2.b(4) of the SEIS has been revised.

#### **S4 STATE OF CALIFORNIA - STATE LANDS COMMISSION**

- S4.1 A study evaluating the impacts of production noise on bowhead whales has been funded by MMS and is currently underway. Gray whales have demonstrated that they react to noise sources in a fashion generally similar to bowhead whales. It is reasonable to assume that the bowhead whale would react similarly to a closely related species (e.g. gray whale).
- S4.2 Section IV.D.1.a(4) of the SEIS has been revised.
- S4.3 In the SEIS, the risk of an impact from oil and gas activities to "rare" animals is considered lower due to the likelihood of these animals coming in contact with oil and gas activities. However, we agree that an adverse impact to individuals of a "rare" species would be more significant. The impact conclusions for these animals must consider both the risk (likelihood of occurrence) and the severity of potential impacts.
- S4.4 Section IV.B.5 contains a generic discussion of impacting agents and their effects on certain species. As stated in this section, the presence of pinniped and cetacean populations in proximity to human activity and marine-vessel traffic strongly suggests that some marine mammals have adjusted to human activities with no apparent



adverse effects. The specific impact analyses for whales appear in Section IV.D for each species, do not conclude that there will be no consequence to whale populations.

- S4.5 This comment is addressed in the response to comment S1.16. Also refer to the discussion of criteria used to select migratory species in Section I.B.2.
- S4.6 One of the assumptions in the SEIS (see Table IV.B.4-1) is the transportation of oil by icebreaking tankers from Norton and Navarin Planning Areas to the Shumagin Planning Area. The analysis discusses the environmental consequences of these transportation networks or methods as they would affect migratory species. For example, impacts to bowhead whales as a result of noise associated with icebreakers and other vessel traffic (including ice breaking tankers) is contained in Section IV.D.1.a(1). The assumption concerning excess production of Alaskan oil to be transported by pipeline is still valid. Although the Four Corners Pipeline project has been cancelled, segments of the All American Pipeline are in various stages of completion.
- S4.7 Although modification of some of the refineries in California may occur, it may not be enough to offset the use of the east-west pipeline systems. It is still assumed that excess oil produced will be transported by pipeline.
- S4.8 The spreading of the *Exxon Valdez* spilled oil over 3,000 square miles and contacting 350 miles of shoreline, as stated in the August SEIS, represented the most accurate and "official" information available ("The *Exxon Valdez* Oil Spill - A Report to the President," May 30, 1989) at the time. Since then, the Trustee Council has indicated in their draft August 1989 report ("State/Federal Natural Resources Assessment Plan for the *Exxon Valdez* Oil Spill") that "to date oil has moved across nearly 10,000 square miles of water in Prince William Sound and the Gulf of Alaska. More than 700 miles of shoreline have been oiled." The text in the SEIS will be revised to reflect this more recent information.
- S4.9 The cumulative analysis in the SEIS assumes that should a large spill occur and contact breeding or migratory habitat when species are concentrated there, large numbers of animals will be killed.
- S4.10 This comment is addressed in the response to comment S1.21.
- S4.11 Accident rates for platforms and pipelines are taken from historic rates in the U.S. OCS because this database reflects U.S. regulations, procedures, time period, and is a large data base (approximately 3,000 platforms and 14,000 miles of pipeline). It is true, there are substantial climatic differences between the Gulf of Mexico and Alaska OCS regions. However, climatic differences would probably not significantly change the current U.S. OCS spill rates, given the huge database within U.S. OCS Regions.
- S4.12 Your comment is addressed in the response to comment S1.12.
- S4.13 Your comment is addressed in the response for comment S1.11.
- S4.14 Thank you for the additional information. As described in the cumulative impact analysis, adverse impacts on fragile coastal resources are expected from increased population growth along the California coast (especially southern California).
- S4.15 Impact associated with the potential production of oil and gas as a result of ANWR is included in only those instances where the migratory species may be affected by this



production. See Section IV.D.1.d for a discussion of the potential effects on the polar bear.

- S4.16 Sections IV.C.8.h(1) and (2) of the SEIS have been revised.
- S4.17 The impact of an oil spill during a spring lead system is not based solely on the oil accumulating on the downwind side of the lead. It is based on whether the migration is delayed or temporarily blocked as well as the bowhead whale's interaction with the spilled oil.
- S4.18 The comment is unclear. The 3%-5% of the feeding area that could be impacted is based on the volume of oil that could be spilled.
- S4.19 The sentence has been changed to better reflect the most comprehensive studies pertaining to the effect of crude oil on cetaceans.
- S4.20 Oil spill impacts to the humpback whales were discussed in the analysis. The statement was revised to clarify that the Farrallon Basin is unlikely to experience exploration and development activities which result in noise and other impact producing factors.
- S4.21 The response of all whales to icebreakers was factored in the cumulative analysis. Also see response to comment S4.6.
- S4.22 See response to comment S3.12.
- S4.23 The SEIS has been prepared in response to a remand to the Secretary of the Interior by the U.S. Court of Appeals for the District of Columbia Circuit. The court's decision and the remand to the Secretary for further attention have governed the preparation of the SEIS. The SEIS was prepared to achieve the objectives outlined by the court. Upon completion, the draft SEIS was distributed to all parties who participated in the process to prepare the FEIS for the Proposed 5-Year Program. A *Federal Register* Notice of Availability was published on August 17, 1989. A 60-day comment period followed publication of the draft SEIS. All interested parties, including litigants to the FEIS, have had the opportunity to comment on the draft SEIS.
- S4.24 This comment is addressed in the responses for following comments: F3.3, F3.5, F3.6, and S1.24.

#### **S5 STATE OF WASHINGTON**

- S5.1 The analysis presented in the SEIS is based on the best information currently available. That information is extensive, particularly with respect to the distribution of biological resources that may be affected. Actual field data related to effects of interregional cumulative offshore oil and gas development are not available for all areas because they have not occurred in all areas. It is, therefore, necessary to extrapolate from observations made in areas where activities have occurred, or from laboratory studies in order to reach conclusions regarding cumulative impacts. Although use of these methods does not result in the development of detailed, site-specific assessments, they can be used to develop the cumulative impact information needed to make decisions related to the 5-year leasing program.
- S5.2 The SEIS acknowledged that complete information is lacking for anadromous fish life-history stages. The analysis of oil-spill impacts to salmon and steelhead populations, in particular, assumed that oil spills both contacted and impacted these

populations, in part, because this type of life-history information is either lacking or incomplete.

There are also several data gaps in the ecology of marine mammals and seabirds of the Oregon/Washington Planning Area. This is especially true when compared to what is known of marine wildlife in Alaska and California from MMS-funded studies. The current MMS-funded studies for this planning area will do much to fill many of the gaps of spatial and temporal distribution of certain marine wildlife. The results of these surveys will be incorporated into any future lease sale EIS for this area. However, the detailed information that is known about seabirds and marine mammals in Alaska and California is generally applicable to Washington and Oregon (e.g., responses of marine wildlife to oil and gas activity, response to oil spills, types of habitat, that constitute preferred habitat, migration corridors, timing of migration, etc.). Therefore, when one combines what is known about animals that migrate through Oregon/Washington with the more detailed information known about migrants through Alaska and California, there is sufficient information to make this type of programmatic analysis.

- S5.3 This comment is addressed in the response to comment F3A.1.
- S5.4 Impacts on bowhead whales from oil and gas activities in the Canadian Beaufort Sea are discussed in Section IV.D.1.a. This comment is also addressed in the response to comment S6B.15.
- S5.5 This comment is addressed in the response to comment S3.9.
- S5.6 It is not the role of the SEIS to determine "acceptable level of risk"; that is a decision which resides with the Secretary of the Interior in his review of the 5-Year Program. The SEIS provides the Secretary with the appropriate information on migratory species whereby he can make his decision on acceptability.
- S5.7 This comment is addressed in the response to comment F7.7.
- S5.8 The killer whale was not included for analysis in the SEIS because it does not meet all the criteria outlined in Section I.B.2. Specifically in the context of this analysis, the killer whale is resident in some areas, while in other their movements may reflect prey availability. The potential effects of the 5-year program on the killer whale are evaluated, however, in the FEIS for the program (reference FEIS Section IV.B.11.a(4)(c)).
- S5.9 The additional migratory fish species were not included because they did not meet all the criteria outlined in Section I.B.2 or were represented in the analysis by a candidate species.

Pacific halibut was not discussed in the SEIS since long-distance migrations are apparently not characteristic of the species. Although tagging experiments have indicated that some fish may move long coastwide distances, most of the population apparently does not migrate over such long distances (Hart 1973, and The International Pacific Halibut Commission, 1987). Although the life-history characteristics of Pacific halibut differ from Pacific whiting, the early life-history stages (i.e., eggs and larvae) of both species are expected to be most sensitive to oil-spill impacts. Impacts to these early life stages of Pacific halibut (as well as juvenile and adult stages) from oil spills associated with existing or approved

activities, or the current and future 5-year programs, are expected to be generally comparable to those concluded for whiting.

Sablefish was not discussed in the SEIS analysis since it is considered a nonmigratory species that moves only short distances (MBC 1987). Although not considered in this analysis, impacts to the two sablefish stocks occurring in the Pacific Region (see MBC 1987) from oil-related activities or impacting agents associated with existing or approved activities, and the current and future 5-year programs are expected to be generally comparable (i.e., very low to negligible) to those discussed for Pacific whiting in the SEIS.

Pacific herring was not considered in the SEIS since there was little indication that the species undertakes migrations (Hart 1973) required by the criteria listed in Section I.B.2. Impacts to herring from existing and approved oil-related activities, or the current and future 5-year programs, are primarily expected from oil spills that would interfere with spawning activities in nearshore waters, or would contact and impact eggs attached to eelgrass, or nearshore concentrations of larvae or juveniles. As discussed for salmon and steelhead in the SEIS, only oil spills occurring in the vicinity of spawning areas are likely to impact herring. Impacts to Pacific herring populations from oil-related activities or impacting agents, particularly oil spills, could potentially cause population decreases lasting up to 6-9 years.

Green and white sturgeon, which are anadromous, were not specifically considered in the SEIS since the anadromous salmon and steelhead were considered broadly representative species. Although sturgeon are not salmonids, their general life-history characteristics are similar to salmonids. Potential impacts to green and white sturgeon from oil-related activities or impacting agents associated with existing or approved activities, and the current and future 5-year programs, are not expected to be as high or higher than those concluded for salmon and steelhead in the SEIS.

Sea-run cutthroat trout was not specifically analyzed in the SEIS since Pacific salmon and steelhead trout were considered generally representative of this species. In general, potential impacts to sea-run cutthroat trout populations from oil-related activities or impacting agents associated with existing or approved activities, and the current and future 5-year programs, are not expected to be as high or higher than those concluded for salmon and steelhead in the SEIS.

- S5.10 Additional species requested for inclusion in the final SEIS were evaluated based on the criteria listed in Section I.B.2. Based on this evaluation, an analysis of the cumulative impacts to the bald eagle has been added to the document.
- S5.11 Snowy plovers are included in the general discussion of shorebirds (see Sections III.C.2.e and IV.D.2.b(5)). Also see response to comments F8.10 and S2D1.12.
- S5.12 This comment is addressed in the response to comment F6.2.
- S5.13 In the cumulative impact analysis, seabirds were considered as belonging to two main groups: seasonal migrants (represented by phalaropes and shearwaters) and resident breeders (represented by alcids - which includes murrelets). The cumulative analysis conclusion considered the impacts to both groups. These groups are considered "equally affected" in terms of oil spills. Section IV.D.2.b(4) in the SEIS has been revised.



- S5.14** This comment is addressed in the response to comments F8.10, S2D1.13, S5.1, and S5.2. Section IV.D.2.b(4) in the SEIS has been revised.
- S5.15** This is not correct. In the case of both Pacific salmon and steelhead, the conclusion of moderate cumulative impacts was due to a combination of both overfishing and oil-spill effects. This was clearly stated in the conclusion section for each species. The SEIS analyses for both salmon and steelhead indicated that the impact of an oil spill on a stock or population (due to effects on outmigrating smolts, nearshore juveniles, or spawning adults) is expected to occur primarily, but not entirely, over the period of time that the affected year class contributes to the stock abundance. The 1-5 year duration for impacts to salmon stocks stated in the SEIS was meant to serve as a generalization since there is a high degree of variability between salmon species and stocks in the spawning contribution of a given year class over subsequent years. It is possible that an oil spill may affect a stock over a longer period, and this is acknowledged in the SEIS.
- It is not possible, nor is it necessary, to analyze separate stocks of salmon in a document of this type. Treatment of individual stocks would be more appropriate in a lease sale EIS or a Development Plan EIS where the geographic area of interest is more circumscribed and oil-spill trajectory data are available.
- S5.16** Tribal fishing activities, together with commercial and sport fishing activities, are treated as an impacting agent in the analysis of cumulative impacts to salmon and steelhead, and hence a detailed discussion of treaty fishing right and activities were not considered necessary. We recognize, however, that there are court-mandated treaty fishing rights in Washington, that Indian fishing activities contribute to the total fishing pressure and impact upon individual stocks, and that oil spills, in particular, may affect salmon or steelhead resources that are exploited by Indian tribes. These treaty right and activities are briefly discussed in the original FEIS for the 5-year program.
- S5.17** See response to comment S1.12 concerning the *Exxon Valdez* oil spill. To the best of our knowledge, there are not any published studies currently available concerning the effects of the *Nestucca* oil spill. However, in the seabird analysis (Section IV.D.2.e) does take into consideration seabird mortality as a result of the *Nestucca* oil spill. The Pacific OCS Region of MMS is currently funding studies by Kinnetics and Battelle that are examining the effects of that spill on rocky and sandy intertidal communities, and subtidal communities. Only preliminary progress reports are currently available. We also understand that the State of Washington is preparing a Damage Assessment Report for this oil spill.
- S5.18** The SEIS is being prepared in compliance with the directive of the court on the adequacy of the cumulative analysis on migratory species. The analysis in the document focuses solely on this one issue. The analysis only discusses the environmental consequences of commercial and recreational activities as they would affect migratory species. The impacts of the 5-year program on commercial fishing and recreation are discussed in Section IV.D of the FEIS for the 5-year program.
- S5.19** Your comment is noted.
- S5.20** Section III.B.2.c of the SEIS has been revised.
- S5.21** Section III.B.3.b of the SEIS has been revised.

- S5.22** Section III.B.3.g of the SEIS has been revised.
- S5.23** Section IV.D.2.b(4) of the SEIS has been revised.
- S5.24** Your comments concerning the inclusion of cultural resources offshore Washington State are noted. However, the SEIS is being prepared in compliance with the directive of the court on the adequacy of the cumulative analysis on migratory species in the Alaska and Pacific OCS Regions. The analysis, therefore, focuses only on the cumulative impacts of OCS and non-OCS activities on migratory species in those Regions. These comments and concerns will be taken into consideration during the preparation of the EIS for the next 5-year program.
- S5.25** These alternatives are addressed in Section I.B.4. of the SEIS.

**S6 STATE OF ALASKA**

- S6.1** These comments are addressed in the responses to Attachment S6A.

**S6A STATE OF ALASKA (ATTACHMENT 1)**

- S6A.1** This comment is addressed in the response to comments S1.11. and S1.12.
- S6A.2** This comment is addressed in the response to comment F6.3 and in Section I.B.2. of the SEIS.
- S6A.3** The most important consideration in measuring the seriousness of an impact on a biological resources is the period of time it takes to recover. If a population recovers very quickly to pre-impact levels, then it did not sustain that serious of an impact, regardless of the extent of the population decline. Our definitions of impact levels for biological resources are based primarily on the rate of recovery.
- S6A.4** While impacts on local populations from the *Exxon Valdez* oil spill may have been severe (the majority of the scientific information has not been released, see response to comment S4.9), overall impacts to the species in the North Pacific Region are not likely to be high.

This comment on sea otters is addressed in the response to comment S1.16.

The SEIS should not be interpreted as stating that deferring one or more planning areas or the no action alternative would do nothing to reduce impacts to polar bears. The deferrals would lower the estimated incremental level of cumulative impact, but not below existing levels already being experienced.

- S6A.5** We agree that the lower resource estimates for eight of the Alaska Planning Areas would decrease the potential impacts associated with the development of these resources. For several planning areas the decreases represents a change in the level of infrastructure required to develop the resources. A determination was made that since the SEIS is merely supplementing the previous analysis in the FEIS, it was important that consistency in the resource estimates be maintained. The Secretary could, therefore, utilize all the resource information and analysis (physical, biological, and socioeconomic) in both documents when making his decision. Chapter II.B.1.d presents a discussion of the difference between the resource estimates and the implications for the cumulative analysis.

- S6A.6** The water quality within the planning areas of the Alaska Region is considered pristine on the basis of limited trace-metal and hydrocarbon analyses (See Sections III.D.1 to III.D.11 in the FEIS for the 5-year program). In contrast for example, the water quality of the Southern California Planning Area is generally good, but localized areas are measurably degraded, and many small sources of pollutants exist. The water quality in the Pacific Region can be a more contributing factor in the cumulative analysis and, therefore, needs to be addressed in more detail.
- S6A.7** This comment is addressed in the response to comment S1.6.
- S6A.8** Your comment is addressed in the response to comment L8.4. A discussion on the change in the spill rate is contained in Section IV.B.4.a. The same spill rate was used in the FEIS and SEIS to maintain consistency in assumptions and basic analysis procedures in order to be able to compare the analyses results and conclusions between these two documents. The SEIS is, in essence, simply expanding the analysis, in terms of cumulative impacts on migratory species, already conducted in the FEIS. Any change in assumptions or assessment methodology would render the information in both documents no longer applicable or pertinent for the comparative analysis. The information on the different resources (air quality, recreation, etc.) must be comparable, so the Secretary can evaluate the impacts associated with each alternative. However, based on the lower spill rates, the assumed number of spills would be lower and therefore, would result in potentially lower impacts to migratory species. Lease sale EIS as a result of the 5-year program will incorporate the newer spill rates.
- S6 STATE OF ALASKA (ATTACHMENT 2)**
- S6B.1** This comment is addressed in the response to comment F3.3.
- S6B.2** This comment is addressed in the response to comments F3.3 and S6A.3.
- S6B.3** Sections III.B.3.c and IV.D.1.c(2) have been revised.
- S6B.4** Data concerning the estimate of the harbor seal population was taken from DOC (1987).
- S6B.5** The assumptions on the status of harbor seals in Alaska are based on Hoover (1988). Section IV.D.1.c(7) of the SEIS has been revised to clarify misleading statements.
- S6B.6** As stated in the SEIS the analysis assumes the implementation of all mitigating measures required by statute and/or regulation. In addition for the purpose of analysis in the SEIS, it was assumed that the mitigation measures adopted by the Secretary for the 1987 Program will be implemented for current and future 5-year programs. The stipulation cited by the commenter was not one of the stipulations adopted by the Secretary and therefore, was not included in the assumptions for this analysis. Stipulations such as the seasonal drilling stipulations are developed to mitigate specific impacts associated with a particular lease sale. Mitigation required by regulations and/or laws are considered in place concerning future activities. Also, see the response to comment F6.4.
- S6B.7** This comment is addressed in the response to comments S4.8 and S1.12.
- S6B.8** This comment is addressed in the response to comment S1.12.
- S6B.9** This comment is addressed in the response to comment L4.8.



- S6B.10 We are unaware of any published scientific data indicating that pink salmon have utilized or inhabited oiled intertidal areas. A report under contract to NOAA and MMS indicates that salmon do avoid oiled waters (Dames and Moore, 1989).
- S6B.11 As indicated in the SEIS, observations to date suggest that some marine mammals have adjusted to human activities with no apparent adverse effect. Avoidance of natural or unnatural obstacles does not necessarily imply that the animal has been disturbed or impacted. Significant impacts occur only when an animal avoids activities or noise that it associates with danger (e.g., hunters and predators). In general, noise associated with OCS activities has been observed to have only minor short-term effects on some marine mammals, while others appear to have habituated to it and to other noise associated with human activities.
- S6B.12 Section IV.B.5 of the SEIS has been revised.
- S6B.13 Section IV.C.2.a of the SEIS has been revised.
- S6B.14 Section IV.C.3 of the SEIS has been revised.
- S6B.15 Although not specifically described in the Projects and Proposal activities, if a particular marine or coastal activity which occurred outside the Alaska and Pacific Regions, could result in a significant effect on a migratory species, it was considered in the cumulative impact analysis section for that species. For example, potential impacts from noise and traffic associated with jet skiing, parasailing, and whale watching to humpback whales that winter near the Hawaiian Islands are described in Section IV.D.1.a(3). Impacts to peregrine falcons as a result of habitat destruction in Central and South America are described in Section IV.D.2.a(1).
- S6B.16 Noise conditions in the lead system and whale behavior, in general in the presence of exploration units and production platforms were analyzed in the SEIS in Section IV.D.1.a(1). Based on this analysis, there should be little avoidance of platforms or drilling units located in or near the spring lead system, and adverse impacts on the migration should be minimal.
- S6B.17 The sensitivity and response of whales to noise is proportional to their perception of danger associated with such noise. Noises associated with OCS operations result in only minor, short-term, or no response, while those associated with approaching whaling vessels elicit significant long-term responses. Potential impacts to whales in the spring lead system would be more likely to occur as the result of hunting, than of OCS operations. The generic impacts associated with this section was summarized and incorporated by reference from the FEIS for the Chukchi Sea Oil and Gas Lease Sale 109 (DOI, MMS, 1987). The discussion of the spring lead system does not imply that the lead system is "constantly" shifting. However, when compared to a stationary object such as a production platform and based on the nature of the spring lead system, it can be considered mobile.
- S6B.18 Although the probability of an oil spill adversely affecting fall-migrating bowheads in the Hope and Norton Basins at the Bering Straits is very low, impacts associated with oil spilled during the fall migration through the area are similar to those which might occur if oil were spilled into a lead system. Those impacts are discussed in detail on pages IV-B-78 through IV-B-82 of the Chukchi Sea Oil and Gas Lease Sale 109 FEIS which was incorporated by reference.

- S6B.19 A specific analysis on the interaction of oil and ice during the different seasons is discussed in Section IV.D.1.a(1) and in detail on pages IV-B-78 through IV-B-82 of the Chukchi Sea Oil and Gas Lease Sale 109 FEIS.
- S6B.20 The areal extent of the oil spill would be limited by the ice in the winter months. Oil spilled under winter ice would pool and freeze to the underside of the ice. Thus, oil would not spread appreciably along the underside of the ice before being frozen into the ice. The spilled oil would then move as part of the ice pack. (See pages IV-B-78 through IV-B-82 of the Chukchi Sea Oil and Gas Lease Sale 109 FEIS which was incorporated by reference.)
- S6B.21 In the winter, the bowhead whale appears to be scattered throughout the west-central Bering Sea (NOAA, 1987) with occasional occurrences southeast of the area.
- S6B.22 As indicated in the analysis in the SEIS, bowhead whales do occasionally enter State lease sale areas. The possible effects of noise and oil and gas activities associated with these areas are taken into consideration in the impact analysis.
- S6B.23 The inhalation of hydrocarbon vapors would generally be minor, unless whales are confined to an area of freshly spilled oil. Humans have shown severe and long lasting reactions to crude oil and gasoline. It is inappropriate to draw a conclusion based on relating human reactions to crude oil to cetacean reactions.
- S6B.24 It is agreed that the noise levels will likely increase. However, it is not expected that "full scale OCS development" associated with the current and future 5-year programs will be concentrated in one area.
- S6B.25 The total expected mean number of oil spills from all sources (see Table IV.B-2) is 13. The SEIS has been corrected (Section IV.D.1.b(1)).
- S6B.26 The impacts from oil on cetacean is based on Geracie et al. (1982, and 1985). It is most conceivable that whale which are under stress to age or a weakened condition might potentially die.
- S6B.27 Section III.B.3.c and IV.D.1.c(2) of the SEIS has been revised.
- S6B.28 Information in Hover (1988) does not substantiate a greatly reduced sea lion population throughout the Bering Sea, and perhaps the northern Gulf of Alaska. Taking into consideration the information provided in the comment, there would be no substantive change in the conclusion stated in the SEIS.
- S6B.29 This comment is addressed in the response to comment S6B.5
- S6B.30 Section IV.D.1.c(7) of the SEIS has been revised.
- S6B.31 This comment is addressed in the response to comments S6B.5.
- S6B.32 Section IV.D.1.c(7) of the SEIS has been revised.
- S6B.33 Section IV.D.1.d of the SEIS has been revised.
- S6B.34 The number of bears that might unavoidably be killed in defense of life and property at OCS facilities is likely to be insignificant due to low polar bear densities. Additional information is needed to support the statement that several hundred bears would be affected by a major spill and cleanup activities.

- S6B.35** If a subsistence harvest of 135 bears is approximately equal to 21 percent of annual mortality, then annual mortality may equal approximately five times this number. Since the polar bear population is able to sustain itself with this level of mortality, it is not reasonable to assume that the mortality (relatively few individuals) associated with a spill could result in a high impact on the population.
- S6B.36** The moderate impact is based on the expected loss of some or all of the six nesting pairs and on the time it would take for the species to recover to preimpact levels. Golden eagles did not meet all the criteria listed for inclusion in the SEIS (See Section I.B.2).
- S6B.37** Section IV.D.2.b(4) in the SEIS has been revised.
- S7 STATE OF SOUTH CAROLINA**
- S7.1** The comment is noted.
- S8 STATE OF MISSISSIPPI**
- S8.1** The comment is noted.
- S9 STATE OF MARYLAND**
- S9.1** The comment is noted.
- S10 STATE OF PENNSYLVANIA**
- S10.1** The comment is noted.
- S11 STATE OF OREGON**
- S11A COUNTY OF COOS**
- S11A.1** The comment is noted.
- S11B COUNTY OF CURRY OREGON BOARD OF COMMISSIONERS**
- S11B.1** The comment is noted.
- S11C STATE HISTORICAL PRESERVATION OFFICE**
- S11C.1** The State Historical Preservation Office commented that an analysis of impacts on cultural resources as a result of oil and gas leasing in coastal areas be considered for inclusion in the SEIS.

The SEIS was prepared in compliance with the directive of the court on the adequacy of the cumulative analysis on migratory species in the Alaska and Pacific OCS Regions. The analysis, therefore, focuses only on the cumulative impacts of OCS and non-OCS activities on migratory species in those regions. Although the scope of the SEIS is confined to migratory species in the Alaska and Pacific OCS Regions, the cumulative impact analysis in the EIS for the next 5-year program will consider the effects of the leasing program on cultural resources in the Pacific Region.



**S11D DEPARTMENT OF ENVIRONMENTAL QUALITY**

- S11D.1** The Department of Environmental Quality commented that more emphasis and specific information be provided on oil and gas impacts on Oregon.

Although the descriptions of the type and levels of impact for each migratory species are general and qualitative in nature, the level of detail is sufficient for the Secretary to make a decision at the programmatic stage. If a decision is made to schedule a lease sale in the Washington/Oregon Planning Area a much more detailed analysis will be performed. At each stage in the process, more specific information will be available, thereby, allowing for more quantification of the types and levels of impact.

**S11E OREGON STATE FISH AND WILDLIFE**

- S11E.1** Oregon State Fish and Wildlife commented that the environmental impact was adequately described and provided no comments.

**S12 STATE OF ALABAMA**

- S12.1** The State Historic Preservation Officer, Planning and Economic Development, and the South Alabama Regional Planning Commission commented that the SEIS pertains only to the states of Alaska, Washington, Oregon, and California, and therefore provided no comments on the adequacy of the document.

**INDUSTRY**

**II ALASKA OIL AND GAS ASSOCIATION**

- II.1** Several factors were taken into consideration in arriving at the cumulative impact level conclusion for northern fur seals besides impacts associated with routine exploration and development activities. Although conditional resource estimates for the St. George Basin have decreased, the cumulative impacts conclusion for the northern fur seal was based on the assumptions concerning the development of oil and gas resources in the Alaska and Pacific Regions.

We maintain that consistency in assumptions and basic analysis procedures between the FEIS and SEIS is paramount in order to be able to compare the analyses results and conclusions between these two documents. The SEIS is, in essence, simply expanding the analysis, in terms of cumulative impacts on migratory species, already conducted in the FEIS. Any change in assumptions or assessment methodology would render the information in both documents no longer comparable and therefore, not appropriate for informed decision making. The information on the different resources (air quality, migratory species, recreation, etc.) must be comparable, so the Secretary can evaluate the impacts associated with each alternative.

- II.2** The SEIS has been revised, where appropriate.  
**II.3** Section IV.D.1.a(1) of the SEIS has been revised.

**I2 AMERICAN PETROLEUM INSTITUTE**

- I2.1** Your comments are noted.

## LOCAL GOVERNMENTS AND ORGANIZATIONS

### L1 CALPIRG

L1.1 Your comments are noted.

### L2 CITY OF CAPITOLA

L2.1 The "existing activities" in the cumulative analysis explanation of Alternative III represent not only OCS but also non-OCS activities. The *Exxon Valdez* oil spill was transporting oil from the TAPS terminal. TAPS oil is not OCS production and is, therefore, considered part of the "existing activities" in the area. We agree that, as a result of oil and gas activities in a planning area, the impact to migratory species would potentially increase. However, this incremental impact when added to other past, present, and reasonably foreseeable future actions occurring in the planning areas does not raise those impacts to a higher level.

L2.2 See Sections I.B.3 and I.B.4 concerning alternatives and method for the cumulative analysis in the SEIS.

L2.3 This comment is addressed in the response for comment S2.4.

### L3 CITY OF SANTA CRUZ

L3.1 See Sections I.B.3 and I.B.4 concerning alternatives and method for the cumulative analysis in the SEIS.

L3.2 The analysis in the SEIS is not constrained by the requirement that a species must concentrate in one vicinity for an impact to occur. If a species is impacted in area of concentration more individuals would be effected, and therefore, impacts to the overall population would be greater. Where densities are lower, fewer individuals would be effected resulting in lower impacts to the overall population. The commenter has not provided any information which would justify a different conclusion. Also, see Section I.B.3 for a description of the method for the cumulative analysis and the response to comment S3.13.

L3.3 See Section I.B.3 of the SEIS concerning the species to be analyzed in the SEIS.

L3.4 See Section I.B.2 of the SEIS concerning the species to be analyzed in the SEIS.

L3.5 This comment is addressed in the response for comment S2.4.

### L4 NATURAL RESOURCES DEFENSE COUNCIL

L4.1 High visibility oil spills such as the *Exxon Valdez* prompt questions as to whether MMS will recalculate its oil spill rates to reflect these events. These events will eventually be included, but an instant recalculation is not warranted. The rate is based upon the number of spills observed versus the total volume of crude oil transported worldwide over a given time period. The accounting of total volume of oil transported has about a 2-year lag in its reporting. The MMS tanker spill rate analysis in 1988 indicated that there has been no significant change in the worldwide tanker spill rate (1.3 spills of 1,000 bbls or greater per billion barrels transported) since previous estimates made in 1983. The current worldwide tanker spill rate includes 29 crude oil spills in U.S. waters out of 140 total spills used in the spill rate calculation. The 1983 spill rate estimates were used in the FEIS and, for consistency, also used in the SEIS.

It is unnecessary to add such spills as the *Exxon Valdez* immediately because other large spills have been accounted for. The MMS tanker spill rate is for crude oil carriers in offshore waters worldwide from 1974 to 1985. The database from which the tanker spill rate was calculated includes 16 crude oil spills that were larger than the *Exxon Valdez*—11% of the observed crude oil tanker spills of 1,000 barrels or greater. However, almost 50% of the observed spills are less than 10,000 bbls in size.

The worldwide tanker spill rate used by MMS can be demonstrated to be consistent with the TAPS experience. For example, there have been 6 spills (greater than 1,000 bbls) from tankers carrying over 6 billion bbls of TAPS oil, see table below. Applying the MMS tanker spill rate to 6 billion bbls of oil transported, MMS would estimate 7 to 8 tanker spills.

Spills of 1,000 bbls and greater of TAPS crude oil transported from Valdez since pipeline transportation began in 1977.

- |          |                                                                                                                     |
|----------|---------------------------------------------------------------------------------------------------------------------|
| 06/07/80 | <i>Texaco Connecticut</i> spilled 4,000 bbl in the Panama Canal Zone. The vessel's destination was Port Neches, TX. |
| 12/21/85 | <i>Arco Anchorage</i> spilled 6,000 bbl in Puget Sound, WA. The vessel's destination was Cherry Point, WA.          |
| 01/06/87 | <i>Stuyvesant</i> spilled 15,000 bbl in the Gulf of Alaska. The vessel's destination was Puerto Armuelles, Panama.  |
| 07/02/87 | <i>Glacier Bay</i> spilled 5,000 bbl in Cook Inlet, AK. The vessel's destination was Nikiski, AK.                   |
| 10/04/87 | <i>Stuyvesant</i> spilled 14,000 bbl off British Columbia. The vessel's destination was Puerto Armuelles, Panama.   |
| 03/24/89 | <i>Exxon Valdez</i> spilled 262,000 bbl in Prince William Sound, AK. The vessel's destination was Long Beach, CA.   |

- L4.2 Based on the worldwide historical spill record, of the 7 large spills estimated to occur as a result of oil transport from TAPS, it is estimated that one spill (approximately 11%—see response L4.1 above) will be larger than that from the *Exxon Valdez*. This spill may occur anywhere along the tanker transport route.
- L4.3 This comment is addressed in the response to comment S1.21.
- L4.4 Although a very large spill of a specific size (e.g., 100,000 bbl) was not explicitly analyzed for in the SEIS, spills of such a size or greater, as for example the *Exxon Valdez* magnitude (approximately 240,000 bbl), were considered in the impact analyses (See Section IV.D.2.a - Bald eagles). Spills of such a large magnitude are usually associated with tanker transportation accidents and impacts associated with tanker transportation are clearly analyzed throughout the SEIS. For example, in the analysis of Pacific salmon (section IV.D.3.a), the occurrence of tanker spills and contact of sensitive life stages of salmon occurring in nearshore waters of productive salmon rivers is assumed. It was also assumed that for the purpose of analysis that the number oil spills listed in Table IV.B.4-2 in each planning area would occur with uniform frequency in the planning area over the next 35- to 40- year life of the cumulative scenario. Also, see response to comment L4.1.



- L4.5 This comment is addressed in the response to comment S1.20.
- L4.6 More recent information ("State/Federal Natural Resources Assessment Plan for the *Exxon Valdez* Oil Spill," August 1989) on the estimate of shoreline oiled has been obtained and the SEIS will be revised to reflect this information - refer to response to comment S4.8. We are not aware of the Coast Guard information mentioned by the commenter as being documented through formal publication.
- L4.7 This comment is addressed in the response to comment S1.12.
- L4.8 The most recent, reliable sources of environmental information on the *Exxon Valdez* oil spill ("The *Exxon Valdez* Spill—A Report to the President," and "State/Federal Natural Resources Assessment Plan for the *Exxon Valdez* Oil Spill") are discussed in the response to comment S1.11. Information from these sources has been considered and used in the preparation of the final SEIS, however, the application of available information regarding fate of oil in water in the SEIS has been limited. This type of information is essentially descriptive in nature documenting the distribution and persistence of the spilled oil in the water and shorelines. This preliminary case history description deals with the fate of an oil spill originating from a single spill source and is most instructive when considering the fate of oil from future spills originating in and around Prince William Sound. The scope of this SEIS, however, encompassed the offshore area along the entire U.S. Pacific coast and along all of Alaska. Also, the fate of oil described in these most recent information sources dealing with the *Exxon Valdez* spill is not significantly different from that already described in section IV.A.4.c—"Fate of Oil in the Marine Environment" in the FEIS.
- L4.9 This document supplements the previous impact analysis in the FEIS for the 5-Year Program. As stated in the FEIS the estimated mean spill number used in preparation of the oil spill table (Table IV.B.4-1) is expressed as the number of spills per billion barrels produced or transported. The tanker spill calculations for this table were based upon a spill rate of 1.3 spills greater than or equal to 1,000 barrels per billion barrels transported (Lanfear and Amstutz, 1983). The 1.3 rate is comprised of two spill rates: 0.9 spills per billion barrels "at sea" (spills in coastal or offshore waters); and 0.4 spills per billion barrels "in port" (spills in the harbor or at the pier). The estimated mean number of tanker spills "at sea" and "in port" can be calculated as a 69 percent/31 percent split of the value identified in Table IV.B.4-1. For example, the estimated 1.15 tanker spills for the Southern California Planning Area is actually 0.80 tanker spills "at sea" and 0.35 tanker spills "in port." The analysis in the SEIS assumes that an oil spill would contact the species at areas of critical activities some of which are located in State waters or at or near port and harbors (see Section IV.D.1b(3)).
- L4.10 See response to comment F3A.1. It is unreasonable and speculative for a programmatic analysis to estimate the specific level of activity for each year over a 35- to 40-year period. Some of the major factors which are taken into consideration when developing the pace of exploration and development within a sale area are: a) historical information; b) whether there is existing infrastructure in the area; c) available geologic, engineering, economic information; d) geographic location of the areas; and e) water depth. Many of these factors are time dependent and can change as new information becomes available. It is more reasonable to take a conservative approach and assume that all the resources will be developed, and to specify the overall level of activity in terms of numbers of wells and platforms (Table II.B.1-1) required to develop those resources. It was assumed that a combination of exploration, development or production activities would occur in every planning

areas based on the level of activity presented in Table II.B.1-1) throughout the life of the cumulative scenario. The incremental impacts associated with the level of activity required to develop the conditional resource estimates can then be better analyzed with past, present, and reasonably foreseeable future activities.

- L4.11** Section IV.B.4.a of the SEIS explains why each analyst assumed two large oil spills occurred within a species migratory range during 1 year. The principal reason is to respond to the court's directive to consider "simultaneous" development. It is reasonable and conservative to assume that if simultaneous development occurs, then simultaneous accidents (i.e., large oil spills) could also occur. However, it was not considered reasonable to assume one of those spills occurred in a planning area for which less than one large spill was estimated to occur (refer to Table IV.B.4-2 of the SEIS). To enhance the conservative nature of this oil-spill scenario, each analyst selected the two planning areas for large spills based on the sensitivity of the species being analyzed. That is, the analyst placed the spills in the planning areas that would seem to be the most detrimental to each species.

Section IV.D of the SEIS has been revised, where appropriate, to explicitly indicate the two planning areas in which large oil spills were assumed to occur during the same year.

- L4.12** Specific assumptions on transportation networks for an EIS are based on many different criteria. One criterion is the volume of oil and gas expected to be developed as a result of a particular action. The assumptions used in the SEIS and the Sale 92 EIS are similar. It was assumed for the Sale 92 EIS that pipelines would be used to transport oil and gas from offshore production platforms to a major onshore storage and loading transshipment terminal at Balboa Bay. This was the primary assumption used in the impact analysis for the Sale 92 EIS. The SEIS, therefore, does not understate the oil-spill risks to this area.
- L4.13** The estimated mean spill number used in preparation of the oil spill table (Table IV.B.4-1) is expressed as the number of spills per billion barrels produced or transported and not per million barrels. Also see response to comment S1.14.
- L4.14** It is generally true that substantial changes in conditional mean resource estimates, would result in changes in the potential impacts associated with the development of these resources. However, analysis of the increase in the 1987 conditional resource estimates (increase is relatively insignificant) does not appreciably change the development assumptions used in the cumulative impact analysis. A minor increase or decrease in the resource estimate does not result in a major increase or decrease in potential impact levels because the changes would not affect the development assumptions in a substantial way. These increases are not even significant in a lease sale EIS, *Tribal Village of Akutan v. Hodel* 869 F.2d 1185 (9<sup>th</sup> Cir.1989); so these increase can not be significant at a programmatic stage.
- L4.15** This comment is addressed in response to comment S1.15.
- L4.16** The SEIS does conclude that, with the exception of the northern fur seals and seabirds, deferring one or more planning areas would not reduce the overall level of cumulative impact on any migratory species. However, the conclusion should not be interpreted to mean that deferring one or more planning areas would do nothing to reduce impacts. Deferrals would lower the estimated level of cumulative OCS-related activity. Deferrals would also reduce the estimated cumulative number of large oil spills. These factors were considered in the analysis; and in some cases, a



reduction in cumulative impacts would be expected, if leasing did not occur in a planning area.

Based on the revised analysis for seabirds (Section IV.D.2.b(4)) an alternative was developed to mitigate impacts associated with development of the Navarin Basin Planning Area. Although in the Southern California Planning Area, almost half the estimated number of large oil spills would be eliminated by deferring it from the program, this did not significantly change the assumptions about the number of oil spills that contact a particular migratory species along its entire range. Thus, impacts are expected to be about the same, with or without development associated with the proposal; therefore, impact levels did not change. Also see Section I.B.3 concerning the method used in the cumulative analysis.

**L4.17** Please see responses to comments L2.1 and S3.13.

**L4.18** Section IV.D.2.b(4) of the SEIS has been revised. Also, please see responses to comments F8.29, F8.30, and S3.18.

**L4.19** This comment is addressed in the response to comment S1.23. An analysis of the cumulative impacts on the bald eagles has also be included in the SEIS (See Section I.B.2).

**L4.20** As stated in the first paragraph of Section III.B.5., the SEIS incorporates by reference Section IV.A.7 from the FEIS for the 5-year program. Analysis of the cumulative impacts to the various migratory species which incorporates the more recent studies is contained in Section IV.D of the SEIS.

#### **L5 NORTHWEST INDIAN FISHERIES COMMISSION**

**L5.1** The SEIS is being prepared in compliance with the directive of the court on the adequacy of the cumulative analysis on migratory species in the Alaska and Pacific OCS Regions. The analysis, therefore, focuses only on the cumulative impacts of OCS and non-OCS activities on migratory species in those Regions. Tribal fishing activities are discussed only as they relate to the potential impacts which they may cause to migratory species.

**L5.2** The walleye pollock does occur within the Pacific Region, but was not specifically addressed in the SEIS since the Pacific whiting was considered representative in terms of its life history (see response to comment F3.8) and its oil-sensitive life-history stages. The cumulative impact to walleye pollock occurring in the Pacific Region is expected to be generally comparable to that discussed in the SEIS for pollock occurring in the Gulf of Alaska and the Bering Sea.

See response to comment S5.9 concerning Pacific halibut.

**L5.3** Sections IV.D.3.a(2) and IV.D.3.d of the SEIS have been revised.

**L5.4** Section IV.D.3.a(2) of the SEIS has been revised.

#### **L6 CENALIULRITT**

**L6.1** The comments are noted.



**L7 OREGON NATURAL RESOURCES COUNCIL**

**L7.1** This comment is addressed in the responses for comments F3.3 and S2.4.

**L7.2** This comment is addressed in the response for comment F3.6.

**L7.3** The purpose of the SEIS is to correct a deficiency found in the final EIS for the current 5-year leasing program. That deficiency is the lack of consideration of the cumulative impact to migratory species of the Alaska and Pacific Regions caused by simultaneous OCS development in both Regions. Thus, the scope of the SEIS and the species analyzed for impact are confined to species that migrate among planning areas in those two Regions. An analysis of potential impacts to migratory species in all four OCS Regions will be included in the EIS for the next 5-year OCS program. Reference Section L.B. of the SEIS for additional explanation.

**L7.4** See Section L.B.4 for a discussion on alternatives.

**L7.5** Information essential to a reasoned choice among alternatives is available for each species and was used in the preparation of the SEIS. For example, impact analyses for all pinniped species were performed using similar sensitivity and vulnerability criteria, with emphasis on information concerning seasonal distribution, abundance, and movements. Straight forward analysis of data tiered from other environmental documents allowed estimation of potential population level changes and probable recovery times, thereby allowing for the assignment of an expected level of impact as defined in Appendix A.

**L7.6** The SEIS focuses on the cumulative effects of the 5-year program on migratory species. Where the impacting agents mentioned had an effect on these types of species, they were analyzed in the SEIS. Also see responses F8.14 and S1.6.

**L7.7** Consistency in assumptions and basic analytical procedures between the FEIS and SEIS is paramount in order to be able to compare the analytical results and conclusions between these two documents. The SEIS is simply expanding the analysis, in terms of cumulative impacts on migratory species, already conducted in the FEIS.

Also see the response to comment S1.20, concerning the treatment of spills less than 1,000 barrels, and the response to comment L4.14, concerning use of the National Resource Assessment.

**L7.8** This comment is addressed in the response to comment S1.12.

**L8 CENTRAL COAST OCS REGIONAL STUDIES PROGRAM**

**L8.1** One of the major assumptions for the cumulative case was that all conditional hydrocarbon resources will eventually be developed. However, no assumption is made regarding the pace of leasing and development. The development of these resources would be through the existing lease sale process. It would be impossible to estimate the specific number of sales per planning area which would be required to develop the conditional resource estimates over the life of the proposal (35 to 40 years). It is more reasonable to assume all the resources will be developed within that period of time, and to specify the overall level of activity in terms of numbers of wells and platforms (Table IL.B.1-1) required to develop those resources. The incremental impacts associated with the level of activity required to develop the conditional

resource estimates can then be better analyzed with past, present, and reasonably foreseeable future activities.

- L8.2 The cumulative impact analysis is an important part of an EIS, and the information provided by the analysis is an integral part of the decisionmaker's reasoned choice among alternatives. One of the assumptions used in the analysis is that "... some level of exploration and development in the Pacific and Alaska Regions during the next 35 to 40 years will occur simultaneously." However, a scenario indicating a precise level or pace of activity would be unreasonable in a programmatic EIS. As stated, this assumption was made to take into consideration simultaneous development. However, as explained in Section II.B.1.d., it is unlikely that all the resources stated in Table II.B.1-1 would be found and developed simultaneously in every planning area.
- L8.3 Alternatives or mitigation at the programmatic stage would include eliminating planning areas from the lease sale process (See Section LB.4). As shown by the analysis, the deferral of the St. George Planning Area would mitigate potential impacts from simultaneous development. Also see response to comment S1.13.
- L8.4 We maintain that consistency in assumptions and basic analysis procedures between the FEIS and SEIS is paramount in order to be able to compare the analysis results and conclusions between these two documents. The SEIS is, in essence, simply expanding the analysis, in terms of cumulative impacts on migratory species, already conducted in the FEIS. A change in assessment methodology would obfuscate the comparison. Also see response to S6A.5.
- As was indicated in Section IV.B.4.a (Oil Spill Analysis), the more recent (1988) spill rates are unchanged for tanker transportation (1.3 large spills per billion barrels produced or transported) but substantially reduced for OCS platforms (from 1.0 to 0.6) and pipelines (from 1.6 to 0.67) when compared to the 1983 estimates which were used in the FEIS and SEIS. By maintaining the 1983 spill rates, no credit was given for the reduced rates associated with pipelines and platforms and some possible, attendant, environmental impact reduction.
- With regard to not factoring in spills such as the *Exxon Valdez* into spill rates, see the response for comment L4.1.
- It is not clear what data the commenter is referring to with regard to not considering results of recent spills on impacts to seabirds and mammals. If the comment is in reference to the *Exxon Valdez*, see the response for S1.11.
- L8.5 As stated in the court's opinion, different databases and economic analyses are used in determining resource estimates for programmatic and for specific lease sale EISs. Therefore, the inclusion of sale-specific information might skew the comparative analysis required by the OCSLA. We, therefore, maintain that consistency in assumptions and basic analysis procedures between the FEIS and SEIS is paramount.
- L8.6 As stated in Table IV.B.4-1, it is assumed that the volume of oil within the Central and Northern California Planning Areas would be transported by tankers.
- L8.7 It is unclear to which statements your comment is referring. The historical oil-spill rates from U.S. OCS activities are used to estimate spills from production and pipelines, while the worldwide tanker spill rate is used to estimate spills from tanker transportation. It was estimated that 6 oil spills would occur as a result of importation of foreign crude oil. This was based on the total volume of oil expected



to be imported over the 35- to 40-year life of the cumulative scenario. Data concerning the total volume of oil expected as a result of imports was provided by the Department of Energy.

- L8.8 This comment is addressed in the response to comment S1.21.
- L8.9 This comment is addressed in the responses to comments S1.4, S1.6, and S1.17.
- L8.10 This comment is addressed in the response to comment F6.12.
- L8.11 Impacts associated with cleanup and containment activities were considered in the cumulative analysis if a particular migratory species was susceptible to those impacts. For example, see Section IV.D.1.c(1).
- L8.12 See Section LB.2 concerning the species analyzed in the SEIS.
- L9 WASHINGTON STATE COASTAL COUNTIES**
- L9.1 This comment is addressed in the response to comments S5.1 and S5.2.
- L9.2 For the purposes of the SEIS analysis, where the location and timing of future oil and gas activities including oil spills, are highly uncertain, adequate information was considered available to evaluate cumulative impacts to migratory species. Also see response to comment S1.2. For example, as discussed in the SEIS for each species of fish resource, seismic survey activities and the discharge of drill muds and cuttings are not expected to cause any impact to fish populations other than short-term (hours to days) changes in distribution or abundance. In the case of oil spills, however, the analysis acknowledged that such events could impact salmon by making the clear assumption that estimated oil spills contacted and impacted the most sensitive life history stages of salmon and steelhead. This assumption ensured that the impacts of oil spills were incorporated into the cumulative impact analysis.
- L9.3 Comments are noted and have been taken into consideration in the cumulative impact analysis as it relates to particular migratory species.
- L9.4 The analysis presented in the SEIS is based on a quantitative projection of the increase in offshore infrastructure needed to explore for, develop, and produce the oil and gas resources estimated by MMS to exist in commercial quantities (refer to Table II.B.1-1). Projections of non-OCS activities are presented in as quantitative a manner as practicable, given the uncertainties about future events (refer to Section IV.C of the SEIS).
- The analysis of impacts presented in the SEIS is quantitative in many respects. For example, the levels of impact presented in the conclusions are generally defined in quantitative terms (refer to Appendix A). A wholly quantitative analysis of cumulative impacts on migratory species is neither practicable nor appropriate at the program development stage because of uncertainties about specific OCS and non-OCS activities that will occur in the future. Subsequent MMS analyses of OCS impacts will become less qualitative as more becomes known about specific areas to be offered for lease, the tracts actually leased, and specific proposals to explore and develop leases.
- L9.5 This comment is addressed in the response to comment S6B.15.



- L9.6** This comment is addressed in the response to comment S5.8 and in Section I.B.2 of the SEIS.
- L9.7** This comment is addressed in Section I.B.2 of the SEIS.
- L9.8** Based upon an evaluation of the criteria listed in Section I.B.2 of the SEIS, an analysis of the cumulative impacts to the bald eagle has been included in SEIS.
- L9.9** Marine turtles were not analyzed in the SEIS because they are infrequent visitors to the region, in general. We do not disagree that the turtles could be found offshore Oregon and Washington. However, the data enclosed in your comment letter indicates that only one leatherback turtle was taken in 1986, none in 1987, and with the remaining identified leatherback turtles in 1988. This does tend to indicate that they are infrequent visitors.
- L9.10** Although Rogue Reef and Orford Reef were not specifically mentioned, discussion of the movements of the sea lions following the breeding season from California north to haulouts in Oregon, Washington, and Canada was included (See Section III.B.3.b.).
- L9.11** The estimation of cumulative impacts to salmon stocks in the Pacific Region was clearly substantiated. Also see response to comment S3.9. Also see Section I.B.2 concerning species analyzed in the SEIS and the criteria used to identify species to be analyzed in the SEIS.
- L9.12** See responses to comments F6.11, S2D1.13, S2D1.14, and S2D1.15.
- L9.13** A study conducted by Tracor (1989) evaluated the potential effects of seismic airgun arrays on the northern anchovy. The results of this study indicated that the lethal and sublethal effects on anchovy eggs and larvae were very small or nonexistent. The small effects that were observed only occurred in the proximity (3-5 meters) of the airgun array. A second study by Battelle and BNN (1989) investigated the potential effects of seismic airgun arrays on Dungeness crab zoea. No lethal or sublethal effects were documented.
- L10 COASTAL RESOURCES CENTER**
- L10.1** This comment is addressed in Sections I.B.2.
- L10.2** Section IV.B.4.a of the SEIS has been revised.
- L10.3** This comment is addressed in response to comment L10.13.
- L10.4** Section IV.C.8.f of the SEIS has been revised.
- L10.5** We assume your reference is to the proposed "Black Sands Project." In September 1988, the Secretary of the Interior and the Governor of Oregon initiated a cooperative agreement that established a joint Federal/State task force to investigate the black sand deposits located offshore southern Oregon. The objective of this joint effort is to prepare a preliminary analysis of the potential and strategic resources contained in the sand deposits by January 31, 1990. The Department of the Interior and the State of Oregon will decide whether or not future resource and environmental studies are warranted. As such, this project has not advanced to the stage where it could be considered a "reasonable foreseeable future action." Therefore, it was not considered in the cumulative impact analysis.

- L10.6** Cumulative effects of logging, placer mining, etc. activities on salmon were assessed as very low because currently, in Alaska, only a relatively few salmon streams are impacted by these activities, in comparison with the total number of more than 12,000 (Catalogue of Waters Important for Spawning, Rearing, or Migration of Anadromous Fishes, Alaska Department of Fish and Game, 1989). It is also assumed that habitat protection measures, as implemented by State and Federal resource management agencies, will serve to prevent and/or reduce further stream degradation.

The impacts of oil spills on the sensitive life history stages of salmon were evaluated based on a specific number of estimated oil spills and scenarios, as well as the relative number of individuals expected to be contacted by the oil spill.

- L10.7** Section IV.D.3.a(2) of the SEIS has been revised to acknowledge that juvenile salmon are affected by the activities identified in the comment.
- L10.8** Section IV.D.3.a(2) of the SEIS has been revised.
- L10.9** Section IV.D.3.a(2) of the SEIS has been revised.
- L10.10** There is much scientific debate over the magnitude of the impacts of drilling discharges on benthic biota. The fate of these discharges in the marine environment has been evaluated and reported in several studies. In particular, Neff (1985), CSA (1985), as well as EPA (1985) are excellent summaries of the subject. These studies indicate that most ingredients of drilling fluids and produced waters have low toxicity and limited bioavailability to marine organisms. Additionally, they report that the majority of the toxic components are diluted to near background concentration levels within 300 yards of the source. However, most point out that it is next to impossible to draw conclusions about the adverse impacts without qualifying the number of wells drilled, whether the system is unflushed or flushed and whether drilling in deep or shallow waters. Also see response to comment S1.6.
- L10.11** Section IV.D.3.a(2) of the SEIS has been revised.
- L10.12** Section IV.D.3.a(2) of the SEIS has been revised.
- L10.13** Holliday et al. (1987), (i.e., the Tracor Applied Sciences study cited in the references) reported a 35-percent mortality level for 4 day-old anchovy larvae exposed to airgun discharges under one particular set of experimental conditions. However, as clearly reported in the Tracor study, the pressure and cumulative energy levels used in the one particular set of experimental conditions that produced this level of mortality were much higher than would occur under the normal operating conditions of an airgun array.

As clearly stated in the SEIS, several recent studies have suggested that adult fish respond behaviorally to airgun array discharges. It is not so clear, however, that fish consistently exhibit behavioral responses to airgun array discharges during seismic surveys. The study referred to in this comment is not stated but is probably the Dalen and Knutsen (1986) study cited in the SEIS references. Although this study did claim to demonstrate changes in distribution of demersal fishes, the experimental study was not controlled and was conducted over an extended period of time. As a result of these problems, we consider their results equivocal at best.

The SEIS did not cite any studies that addressed the effects of these reported behavioral changes on feeding, reproduction or migration since no such studies have



specifically been conducted to our knowledge. The studies conducted to date, however, suggest only that fish may exhibit alarm and startle responses, small changes in distribution, and possibly a reduced level of availability to commercial fishermen. The analysis in the SEIS indicated that changes in distribution could occur as a result of avoidance or changes in feeding behavior. See response to comment L10.10 concerning drilling discharges.

**L10.14** Section IV.D.3.a(2) of the SEIS has been revised.

**L10.15** This comment is addressed in the response to comment L10.10 concerning drilling discharges.

**L10.16** Spilled oil can sink through the water column and come into contact with the bottom sediments. The fate of spilled oil, however, is related to many factors, including the type of oil that is spilled, the area the oil is spilled; sea and wind conditions; biodegradation processes that break down the oil, and abiotic factors such as evaporation, photo-oxidation, dissolution, and emulsification that also serve to break down and distribute spilled oil. However, a mass balance of spilled oil given by Mackay (1981, as cited in Boesch and Rabalais, 1985), for a speculative but representative case, indicates that even after 100 or more days a relatively small percentage of spilled oil would be found in the bottom sediments.

Even though little oil is expected to reach the bottom sediments at the water depths where Pacific whiting are typically found, it is possible that some oil may sink to the bottom following the processes discussed above. It is unlikely, however, that much of the weathered and degraded oil that might reach the bottom habitat of whiting would be subject to bioaccumulation by whiting or other fishes through feeding on shrimp. If some petroleum hydrocarbons were taken up by whiting, it is expected that they would be metabolized and depurated. Malins and Hodgins (1981, as cited in Ch. 8 of Boesch and Rabalais, 1985), reviewed the effects of petroleum hydrocarbons on marine fish and concluded that aromatic hydrocarbons are accumulated in fish tissues for a short period of time; however, subsequent metabolism and excretion of metabolized byproducts reduce the body burden of these compounds, and increased hydrocarbon concentrations are not always detected. They did suggest, however, that toxic or sublethal effects might be associated with various metabolites of petroleum hydrocarbons.

**L10.17** See Section I.B.4 in the SEIS on alternatives.

**L11 NUNAM KITLUTSISTI**

**L11.1** The statement referenced in the comment is an initial assumption used in the impact analysis. This statement indicated that all conditional resources will eventually be developed; however, no assumption was made regarding the pace of leasing and development. Assumptions such as this are used as analytical tools to assist in the analytical process. Hypothetical levels of exploration and development associated with these estimates then provide the basis of the analysis.

**L11.2** Your comment is addressed in the response to comment F6.4.

**L11.3** This document supplements the cumulative analysis contained in the FEIS for the Proposed 5-Year OCS Oil and Gas Leasing Program, mid-1987 to mid-1992. Discussion on the climatic and oceanographic conditions of the Bering Sea is contained in Section IV.B.15 to IV.B.19 of the FEIS for the 5-year program.



**L11.4** Based upon further evaluation of the criteria listed in Section L.B.2 of the SEIS, an analysis of these seals has been included in the SEIS.

# **CHAPTER VI**

## **REFERENCES**

## VI. References

Only those references which were not cited in the FEIS for the Proposed 5-Year Program are listed below. The remaining references are contained in Chapter VI (pages VI-1 to VI-65) of the FEIS.

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# **CHAPTER VII**

## **PRINCIPAL PREPARERS**

## **VII. PRINCIPAL PREPARERS**

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# **CHAPTER VIII**

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# **APPENDIX A**

## **IMPACT LEVEL DEFINITIONS**

## **APPENDIX A**

### **FISH RESOURCES**

- VERY HIGH —** A population declines resulting in a change in the distribution and/or abundance of the species. The expected duration of the effects is more than three generations\* or 10 or more years.
- HIGH —** A population declines resulting in a change in the distribution and/or abundance of the species. The expected duration of the effects is two or three generations or 6 to 9 years.
- MODERATE —** A population declines resulting in a change in the distribution and/or abundance of the species. The expected duration of the effects is less than one generation or 3 to 5 years.
- LOW —** A population declines resulting in a change in the distribution and/or abundance of the species. The expected duration of the effects is less than one generation or 1 to 3 years.
- VERY LOW —** No discernible lethal effects, but individuals experience sublethal effects which cause reduced biogenic activity or reduced metabolic functions. Organisms would recover to pre-impact condition within one generation or 1 to 3 years.

\* A generation is the term of years accepted as the average period between the birth of the parents and the birth of their offspring (Random House Dictionary, 1982).

## **ENDANGERED AND THREATENED SPECIES**

- VERY HIGH —** A population declines resulting in a change in the distribution and/or abundance of the species. The expected duration of the effects is more than three generations\* or 10 years or more.
- HIGH —** A population declines resulting in a change in the distribution and/or abundance of the species. The expected duration is two or three generations or 6 to 9 years.
- MODERATE —** A population declines resulting in a change in the distribution and/or abundance of the species. The expected duration of the effects is less than one generation or 3 to 5 years.
- LOW —** A population declines resulting in a change in the distribution and/or abundance of the species. The expected duration of the effects is less than one generation or 1 to 3 years.
- VERY LOW —** No discernible lethal effects, but individuals experience sublethal effects which cause reduced biogenic activity or reduced metabolic functions. Organisms would recover to pre-impact condition within one generation or 1 to 3 years.

\*A generation is the term of years accepted as the average period between the birth of the parents and the birth of their offspring (Random House Dictionary, 1982).



## **MARINE MAMMALS AND BIRDS (NONENDANGERED SPECIES)**

- VERY HIGH —** A population declines resulting in a change in the distribution and/or abundance of the species. The expected duration of the effects is more than three generations\* or 10 years or more.
- HIGH —** A population declines resulting in a change in the distribution and/or abundance of the species. The expected duration of the effects is two or three generations or 6 to 9 years.
- MODERATE —** A population declines resulting in a change in the distribution and/or abundance of the species. The expected duration of the effects is less than one generation or 3 to 5 years.
- LOW —** A population declines resulting in a change in the distribution and/or abundance of the species. The expected duration of the effects is less than one generation or 1 to 3 years.
- VERY LOW —** No discernible lethal effects, but individuals experience sublethal effects which cause reduced biogenic activity or reduced metabolic functions. Organisms would recover to pre-impact condition within one generation or 1 to 3 years.

\* A generation is the term of years accepted as the average period between the birth of the parents and the birth of their offspring (Random House Dictionary, 1982).

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